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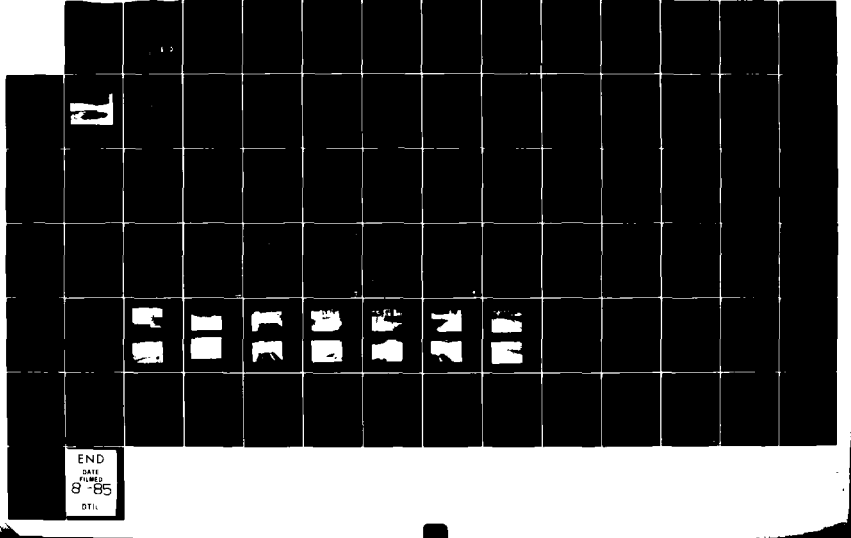

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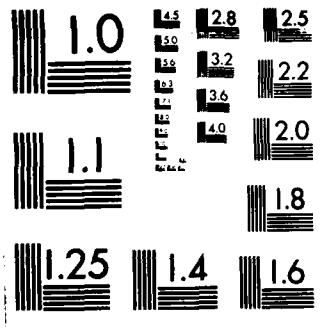

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NEPONSET RIVER BASIN
WALPOLE, MASSACHUSETTS

BIRD POND DAM

MA. 00804

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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4. TITLE (and Subtitle) Bird Pond Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
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18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,
Neponset River Basin
Walpole, Massachusetts
Neponset River

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The dam is an 18.5 ft. high, 291 ft. long composite rubble masonry, concrete and earth embankment. It is small in size with a high hazard potential. The dam is judged to be in generally fair condition because of the seepage through the left spillway training wall and because the low level outlet has not been operated in many years and is presumed to be inoperative.

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424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:
NEDED-E

MAR 0 6 1981

Honorable Edward J. King
Governor of the Commonwealth of Massachusetts
State House
Boston, Massachusetts

Dear Governor King:

Inclosed is a copy of the Bird Pond Dam (MA 00804) Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. The report is based upon a visual inspection, a review of past performance, and a preliminary hydrological analysis. A brief assessment is included at the beginning of the report.

The preliminary hydrologic analysis has indicated that the spillway capacity for the Bird Pond Dam would likely be exceeded by floods greater than 8 percent of the Probable Maximum Flood (PMF), the test flood for spillway adequacy. Our screening criteria specifies that a dam of this class which does not have sufficient spillway capacity to discharge fifty percent of the PMF, should be adjudged as having a seriously inadequate spillway and the dam assessed as unsafe, non-emergency, until more detailed studies prove otherwise or corrective measures are completed.

The term "unsafe" applied to a dam because of an inadequate spillway does not indicate the same degree of emergency as that term would if applied because of structural deficiency. It does indicate, however, that a severe storm may cause overtopping and possible failure of the dam, with significant damage and potential loss of life downstream.

It is recommended that within twelve months from the date of this report the owner of the dam engage the services of a professional or consulting engineer to determine by more sophisticated methods and procedures the magnitude of the spillway deficiency. Based on this determination, appropriate remedial mitigating measures should be designed and completed within 24 months of this date of notification. In the interim a detailed emergency operation plan and warning system should be promptly developed. During periods of unusually heavy precipitation, round-the-clock surveillance should be provided.

NEDED-E
Honorable Edward J. King

I have approved the report and support the findings and recommendations described in Section 7, with qualifications as noted above. I request that you keep me informed of the actions taken to implement these recommendations since this follow-up is an important part of the non-Federal Dam Inspection Program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. This report has also been furnished to the owner of the project, Bird and Sons, Inc., Walpole, Massachusetts.

Copies of this report will be made available to the public, upon request to this office, under the Freedom of Information Act, thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for the cooperation extended in carrying out this program.

Sincerely,

C. E. EDGAR, III
Colonel, Corps of Engineers
Division Engineer

BIRD POND DAM

MA-00804

NEPONSET RIVER BASIN
WALPOLE, MASSACHUSETTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification No.:	MA 000804
Name of Dam:	Bird Pond Dam
Town:	Walpole
County and State:	Norfolk, Massachusetts
Stream:	Neponset River
Date of Inspection:	14 April 1980

BRIEF ASSESSMENT

Bird Pond Dam is an 18.5 ft. high, 291 ft. long composite rubble masonry, concrete and earth embankment consisting of a 39 ft. long central spillway, a 132 ft. long earth embankment to the right of the spillway and a 120 ft. long earth embankment to the left of the spillway. The upstream slopes of both embankments are heavy random rock riprap with concrete grout. The crest and downstream slopes are grass covered. It is a run-of-the-river dam which is used for storing process water for the Bird & Sons, Inc. Manufacturing Company located on the right abutment and downstream toe of the dam. Three intakes to the mill complex are located in the right abutment area. The spillway for the dam has a 3 ft. by 2 ft. low level outlet and has provisions for four 5 ft. 6 in. high by 5 ft. 3 in. wide stoplog bays and two 5 ft. by 4 ft. spillway suice gates. The crest of the spillway is 8.3 ft. below the top of dam.

The reservoir is about 4,000 ft. long and the surface area of the pond at spillway crest is about 22 acres. The drainage area above the dam is about 25.1 sq. mi., the maximum storage to top of dam is about 185 acre ft., and the height of the dam is about 18.5 ft. Based on size and storage, the size classification is small. A breach of the dam could damage three industrial complexes, with the possibility of loss of more than a few lives. Therefore, the dam has been classified as having a high hazard potential. Based upon the guidelines the recommended test flood ranges from a ½ PMF to a full PMF. Because of the downstream industrial developments a test flood equal to a full PMF (15,000 cfs) was selected. Since storage is insignificant and inflow is approximately equal to outflow, a test flood routing was not performed.

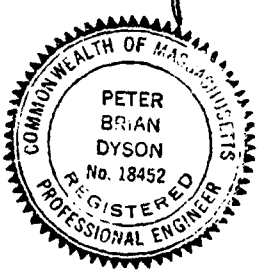
The test flood outflow (15,000 cfs.) would overtop the dam by about 5.7 ft. with stoplogs in place and 5.3 ft. with stoplogs removed. With the stoplogs in place the spillway can pass about 500 cfs of about 3 percent of the test flood outflow without overtopping the dam. With the stoplogs removed and the spillway sluice gates open the spillway can pass about 2,070 cfs or about 14 percent of the test flood outflow without overtopping the dam.

The dam is judged to be in generally fair condition because of the seepage through the left spillway training wall and because the low level outlet has not been operated in many years and is presumed to be inoperative. There is brush and tree growth on the left embankment. Mortar is missing from the joints of the rubble masonry training walls of the spillway. The concrete spillway service bridge is deteriorated. Minor erosion has taken place on the downstream slope of the left embankment. There may also be some seepage from the right spillway training wall which at the time of the inspection could not be determined because of the high flow conditions.

Within one year after receipt of this Phase I Inspection Report, the owner, Bird & Son, Inc., should retain the services of a registered professional engineer and implement the results of his evaluation of the following: (1) a detailed hydrologic-hydraulic investigation to assess further the potential for overtopping and the adequacy of the spillway; (2) possible elimination of use of stoplogs, or modifications to facilitate their quick removal; (3) investigate the seepage through the left spillway wall; (4) determine if there is any seepage emanating from the right spillway training wall; (5) inspect the spillway and stoplog structure during no flow conditions; and, (6) determine the need to relocate two pressure fire hydrants located on the crest of the dam.

The owner should also implement the following operating and maintenance measures; (1) remove trees, root structures and brush growth from the left embankment and backfill with suitable material; (2) reshape the eroded downstream slope of the left embankment and provide topsoil and seed; (3) repoint with mortar all voids in the upstream ends of the rubble masonry spillway training walls; (4) repair spalled and honeycombed concrete in the spillway service bridge deck; (5) determine whether the low level outlet is operative and perform any necessary repair work; (6) develop a formal surveillance and downstream emergency warning plan including round-the-clock monitoring during periods of heavy precipitation; (7) institute procedures for an annual technical inspection of the dam and its appurtenant structures; and, (8) implement a regular periodic maintenance program.

Peter B. Dyson
Project Manager



This Phase I Inspection Report on Bird Pond Dam (MA-00804) has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

Carney M. Terzian

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

Richard J. DiBuono

RICHARD DIBUONO, MEMBER
Water Control Branch
Engineering Division

ARAMAST MAHTESIAN, CHAIRMAN
Geotechnical Engineering Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does <u>not</u> include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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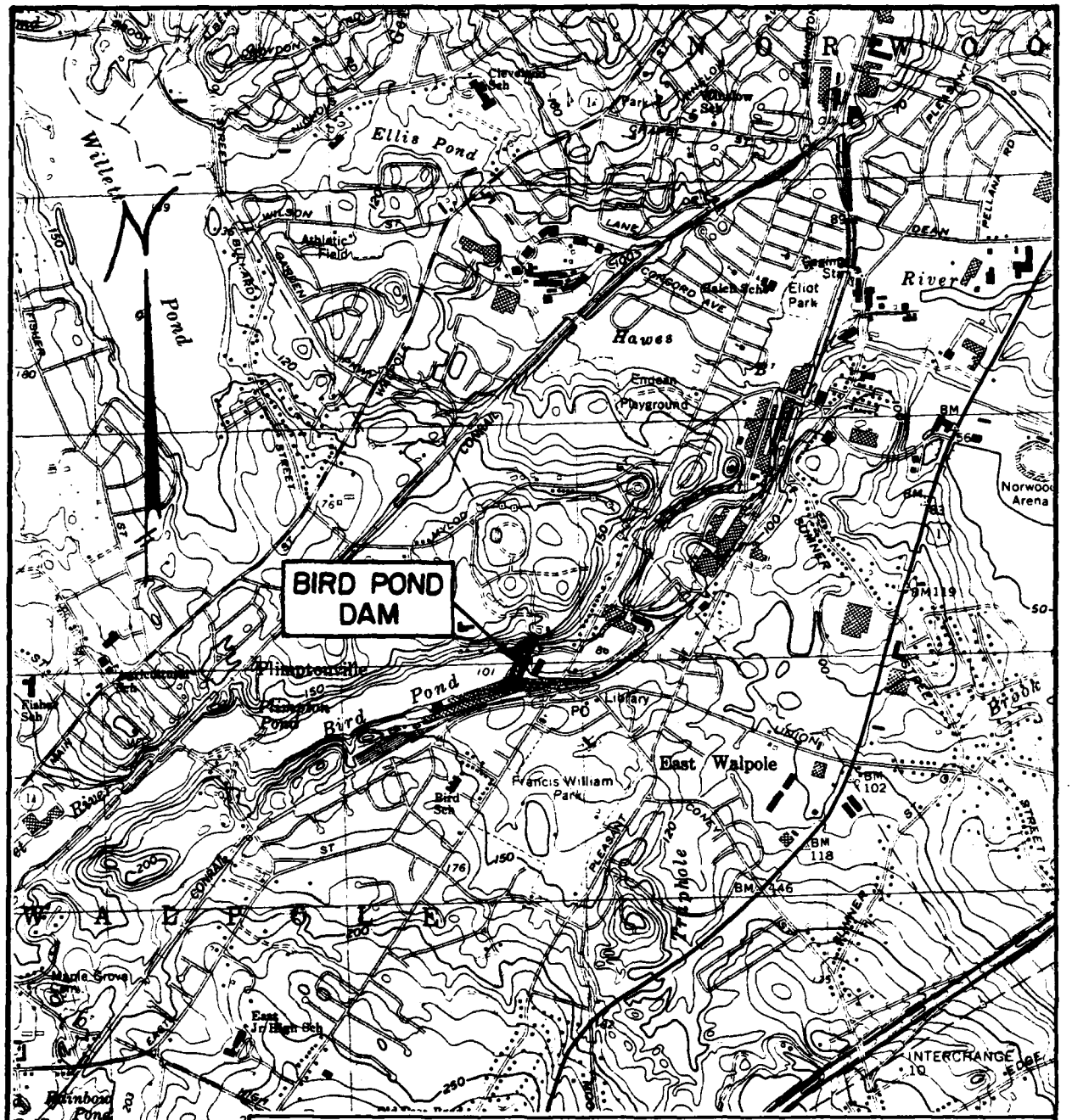
BIRD POND DAM

OVERVIEW OF DAM FROM RIGHT ABUTMENT


BIRD POND DAM
Willett Pond
Ellis Pond
Hawes
Emeson Playground
Eliot Park
Athletic Field
Francis William Park
East Walpole
Bird Pond
Plimptonville
Clark Pond
Rainbow Pond
Golf Course
Norwood Arena
INTERCHANGE 10
LOUIS BERGER & ASSOC., INC
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ARCHITECT : ENGINEER
U.S. ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS
BIRD POND DAM
NORWOOD QUADRANGLE
STATE-MA
SCALE 1:25000
DATE

PHASE I INSPECTION REPORT

BIRD POND DAM MA 00804

SECTION 1 - PROJECT INFORMATION

1.1 General

A. Authority. Public law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Louis Berger & Associates, Inc. has been retained by the New England Division to inspect and report on selected dams in the state of Massachusetts. Authorization and notice to proceed was issued to Louis Berger & Associates, Inc. under a letter of 28 March 1980 from William E. Hodgson, Jr. Colonel, Corp of Engineers. Contract No. DAC33-80-C-0043 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection

(1) Perform technical inspection and evaluation of non-federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-federal interests.

(2) Encourage and assist the States to initiate quickly effective dam safety programs for non-federal dams.

(3) Update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location. Bird Pond Dam is located in Norfolk County in the Town of Walpole in eastern Massachusetts. The Pond is an impoundment of the Neponset River and is located about 15.5 miles upstream from the mouth of the Neponset River at its confluence with the Atlantic Ocean. The Pond is located just upstream of the Washington Street Bridge over the Neponset River. The dam is shown on U.S.G.S. Quandrangle, Norwood, Massachusetts with coordinates approximately at N 42° 09' 46", W 71° 13' 05".

b. Description of Dam and Appurtenances. Bird Pond Dam is a run-of-the-river dam believed to have been originally constructed in the late 1700's. The present dam is a 1906 reconstruction of the original dam and provides process water for Bird & Son, Inc. a manufacturing company with buildings located at the toe of the dam and on the right abutment. The dam is about 291 ft. long, about 18.5 ft. high, and essentially consists of a 39 ft. long composite masonry and concrete gravity overflow section with earth embankments on each side of it. The crest of the overflow section is 8.3 ft. below the top of the dam.

The embankment to the right of the spillway is about 132 ft. long and 15 ft. wide at its narrowest point. The embankment to the left of the spillway is about 120 ft. long and the crest width varies from about 18 ft. at the spillway to about 20 ft. at the left abutment. The downstream slopes of both embankments are about 1½ horizontal to 1 vertical and are sod covered. The upstream slopes are of random rock riprap covered with concrete grout. A paved roadway is located along the toe of the left embankment and downstream slope of the right embankment.

A rubble masonry wall about 365 ft. long extends from the right abutment upstream along the south reservoir rim. The outlet facilities for the dam are located along this wall.

The 39 ft. long spillway consists of rubble masonry training walls and a concrete sillblock along the crest of a sloping downstream apron. There are provisions for four 63 in. wide and two 60 in. wide stoplog bays along the crest of the spillway as well as two 60 in. by 48 in. spillway sluice gates. A 3 ft. by 2 ft. low level outlet is located about 17.3 ft. below the top of the dam. At the downstream toe of the spillway a concrete culvert carries flow under the paved roadway and the mill buildings to the Neponset River (See Appendix C photographs).

Along the south reservoir rim there are three outlet facilities used only to supply process water to the mill buildings. The approximate location of these outlet pipes, all reported to be in operating condition, is shown on Drawing B-1, Appendix B. A 48 in. dia. pipe leads from the reservoir to a holding tank in the mill building on the shoreline. Several outlets from the holding tank provide water for various purposes. There are also 18 in. dia. and 20 in. dia. pipes with gate valves. The location of the gate valves is shown on drawing B-1. These outlet pipes provide condenser cooling water and process water. Since all three of these outlets connect into closed systems they could not be used as a means to empty the reservoir.

c. Size Classification. Bird Pond Dam has a hydraulic height of about 18.5 ft. above downstream river level, and impounds a normal storage of about 113 acre-ft. to spillway crest level and a maximum of about 185 acre-ft. to top of dam. In accordance with the size and capacity criteria given in Recommended Guidelines for Safety Inspection of Dams, the project falls into the small category on the basis of height and storage and is therefore classified accordingly.

d. Hazard Classification. The Neponset River immediately below the dam flows through a closed culvert that passes under a service road and two mill buildings. About 600 ft. below the dam a twin masonry arch structure carries the river under Washington Street. It is estimated that this restriction would reduce the breach flood surge downstream of Washington Street by as much as 58 percent and thereby cause severe flooding of the mill complex located just downstream of the dam. In the reach beyond Washington Street the river passes over another dam located in a mill complex about 1500 ft. below Bird Pond Dam. It is estimated that the stage on this second dam would rise by about 6 ft. as the flood surge passed through this second mill complex and the dam would be overtopped. About 4,400 ft. below Bird Pond Dam the river passes through a third mill complex. It is estimated that at this point the water surface would rise about 4 ft., causing damage to the mill complex. It is estimated that the additional depth of flooding due to the breach discharge could be as much as 12 ft. at the first mill site, about 4 ft. at the second mill site, and about 2 ft. at the third mill site downstream. Under the spillway full conditions it is estimated that only the first mill site would be flooded and the depth of flooding under those conditions would be about 2 to 3 ft. Beyond this third mill the river passes through an urban area for a distance of about 7,000 ft. however, in this area the river is wider and flooding should not be as severe. Beyond this urban development the flood plain widens out significantly and the flood surge should subside in this reach without causing further damage.

A sudden failure of the dam could therefore cause the loss of more than a few lives and result in appreciable industrial economic losses. Consequently, Bird Pond Dam has been classified as having a high hazard potential, in accordance with the Recommended Guidelines for Safety Inspection of Dams.

e. Ownership. Bird Pond Dam is owned by Bird and Sons, Inc. of Walpole, Massachusetts.

f. Operator. Mr. Ross Fallon, Plant Manager, Bird and Sons, Inc., Walpole Massachusetts. Telephone: 668-2500.

g. Purpose of Dam. The dam impounds water used for processing in the industrial buildings located just downstream of the dam and along the right rim of the reservoir.

h. Design and Construction History. No information is available regarding design and construction of the original 17th century dam. Several drawings of the 1906 reconstruction were recovered and indicate that at the spillway section a concrete wall was built against the face of the upstream masonry wall; the present service bridge was constructed about 15 in. above the top of the old bridge; a new stoplog structure and planks were added; the fixed spillway sill was lowered about 9 in.; and, the downstream rubble block apron was grouted with concrete. The designs for the spillway were prepared by Edward A. Buss, Engineer, Boston, Mass.

i. Normal Operating Procedure. According to the owner's representatives the water level in the pond is maintained at or above elevation 98.2 so as to provide process water for the mill's operation. The facility is also operated in conjunction with several other manufacturers located along the Neponset River. Each of these other manufacturers also require specific water levels for their operations. Therefore, all of the dam operators along the Neponset River work together to maintain various water levels for each of the other manufacturers.

1.3 Pertinent Data

a. Drainage Area. The drainage area above Bird Pond Dam consists of about 25.1 sq. mi., described in general as a flat and coastal area. The basin consists of two major subdrainage areas: one extending northerly and drained by Mine Brook; the other extending southerly and drained by the upper reaches of the Neponset River. The northerly drainage area is predominately forested and has a scattered population. The southerly drainage area consists of woodlands, open fields, swamps, and highly developed urban areas. The Neponset Reservoir is located in the upper reaches of the southerly drainage area. It has a drainage area of about 1.5 sq. mi. and would have only a slight effect on the inflow to Bird Pond.

b. Discharge at Damsite

(1) Outlet Works Conduit. The low level outlet works for Bird Pond Dam is a 2 ft. high by 3 ft. wide sluice gate located in the center of the overflow section of the dam at about elevation 86.7 ft. The gate is presumed to be inoperative. It is estimated that if operative, the low level facility would be capable of discharging about 120 cfs with the water surface level in the pond at the top of dam elevation 103.9.

(2) Maximum Known Flood at Damsite. The maximum discharge at the damsite is unknown. It is reported tht during the floods of August 1955 the water surface of the pond reached the crest of the dam's earth embankments and that sand bags were placed along the crest to prevent overtopping of the dam.

(3) Ungated Spillway Capacity at Top of Dam. With the stoplogs in place and the spillway sluice gates closed the spillway capacity at top of dam, elevation 103.9, is 505 cfs. With all stoplogs pulled and the two spillway sluice gates open the spillway capacity at top of dam is 2,070 cfs.

(4) Ungated Spillway Capacity at Test Flood Elevation. With the stoplogs in place and the spillway sluice gates closed the spillway capacity is 2,550 cfs at test flood elevation 109.6. With all stoplogs pulled and the two spillway sluice gates open the spillway capacity is about 4,000 cfs at a test flood elevation of 109.2.

(5) Gated Spillway Capacity at Normal Pool Elevation. Not applicable.

(6) Gated Spillway Capacity at Test Flood Elevation. Not applicable.

(7) Total Spillway Capacity at Test Flood Elevation. With the stoplogs in place and the spillway sluice gates closed the total spillway capacity is 2,550 cfs at a test flood elevation of 109.6. With all stoplogs pulled and the two spillway sluice gates open the total spillway capacity is 4,000 cfs at a test flood elevation of 109.2.

(8) Total Project Discharge at Top of Dam. Whereas the low level outlet is presumed to be inoperative the total project discharge with stoplogs in place and the spillway sluice gates closed is 505 cfs at elevation 103.9. With the stoplogs pulled and spillway sluice gates open the total project discharge is 2,070 cfs at elevation 103.9.

(9) Total Project Discharge at Test Flood Elevation. The total project discharge is 15,000 cfs at test flood elevation 109.6 with the stoplogs installed and spillway sluice gates closed. The total project discharge is 15,000 cfs at test flood elevation 109.2. with the stoplogs pulled and the spillway sluice gates open.

c. Elevation (ft. N.G.V.D.)

(1) Streambed at toe of dam - 85.4

(2) Bottom of cutoff - unknown

(3) Maximum tailwater - unknown

(4) Recreation pool - not applicable

(5) Full flood control pool - not applicable

(6) Spillway crest - 95.67 without stoplogs - 101 with stoplogs

(7) Design surcharge (Original Design) - unknown

(8) Top of Dam - 103.9

(9) Test flood surcharge - 109.6

d. Reservoir (length in feet)

(1) Normal pool - 4,000 ft.

(2) Flood control pool - not applicable

(3) Spillway crest pool - 4,000 ft.

(4) Top of dam - 4,000 ft.

(5) Test flood pool - 4,ooo ft.

e. Storage (acre-feet)

(1) Normal pool - 113

(2) Flood control pool - not applicable

(3) Spillway crest pool - 113

(4) Top of dam - 185.5

(5) Test flood pool - 370

f. Reservoir Surface (acres)

(1) Normal pool - 22

(2) Flood-control pool - not applicable

(3) Spillway crest - 22

(4) Test flood pool - 38.1

(5) Top of dam - 27.5

g. Dam

(1) Type - Concrete overflow section with non-overflow earth embankments.

(2) Length - 291 ft.

(3) Height - 18.5 ft.

(4) Top Width - Right embankment - 15ft
Left embankment - 18 ft. to 20 ft.

(5) Side Slopes - Downstream - 1.5 horizontal to 1 vertical. Upstream unknown.

(6) Zoning - Unknown

(7) Impervious Core - Unknown

(8) Cutoff - Unknown

(9) Grout Curtain - Unknown

h. Diversion and Regulating Tunnel - Not applicable

i. Spillway

(1) Type - 6 Bay, concrete overflow section.

(2) Length of weir - 6 bays having an effective hydraulic width of 31 ft.

(3) Crest elevation - With stoplogs - 101.0
Without stoplogs - 95.67

(4) Gates - 2 - 5' wide x 4' high sluice gates elevation 95.67

(5) U/S Channel - Natural river channel

(6) D/S Channel - Closed conduit with natural bottom which passes under mill buildings.

j. Regulating Outlets

(1) Invert - 86.7

(2) Size - 3 ft. wide x 2 ft. high

(3) Description - Rectangular sluice gate

(4) Control Mechanism - Hand operated

(5) Other - Presently the gate is inoperative

SECTION 2 - ENGINEERING DATA

2.1 Design Data

No data on the design of the dam or appurtenances has been recovered. During the course of the inspection several plans showing the 1906 reconstruction of the spillway were obtained and copies are included in Appendix B.

2.2 Construction Data

No records or correspondence regarding construction of the dam have been found. There are however contractors logs of the grouting of the spillway training walls in 1979.

2.3 Operation Data

According to the owner's representative the water level in the pond is maintained at or above a specific elevation so as to provide process water for the mills operations. The facility is however operated in conjunction with several other manufacturers located along the Neponset River who also require specific water levels for their operations.

2.4 Evaluation of Data

a. Availability. Since no engineering data ia available, it is not possible to make an assessment of the safety of the dam. The basis of the information presented in this report is principally the visual observations of the inspection team.

b. Adequacy. The lack of in-depth engineering data did not allow for a definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history and sound engineering judgement.

c. Validity. Not applicable

SECTION 3 - VISUAL INSPECTION

3.1 Findings

a. General. The visual inspection of Bird Pond Dam took place on 14 April 1980. On that date the water was about 0.9 ft. above the top of the stoplogs or 6.4 ft. above the spillway crest. The discharge was estimated to be about 87 cfs. There was no evidence of major problems, but a few items require attention (see section 7.3). The dam was judged to be in only fair condition because of the seepage through the left spillway training wall and because the low level outlet is said not to have been operated in 20 years and is presumed to be inoperative.

b. Dam. The dam is a run-of-the-river dam with an overall length of about 291 ft. It currently provides process water for a manufacturing company located in part on the south reservoir rim and the remainder immediately downstream of the dam. The present dam is a 1906 reconstruction of the original dam which was built in the 1700's.

The dam basically consists of a 39 ft. long gravity concrete and masonry spillway, a 132 ft. long earth embankment to the right of the spillway and a 120 ft. long earth embankment to the left of the spillway. The dam has a hydraulic height of about 18.5 ft.

The right embankment is of fairly uniform section and is about 15 ft. wide at its narrowest point. A paved roadway is located along the toe of the left embankment and across the downstream slope of the right embankment. Heavy random rock riprap covered with concrete grout protects the upstream slope of the embankment. A concrete retaining wall which is in good condition supports the paved roadway across the lower downstream slope while the upper downstream slope is about 1 ½ vertical to 1 horizontal and is grass covered. There was no evidence of any seepage along the downstream toe of the right embankment. The right embankment appears to be in good condition. (See Appendix C, photo nos. 1 and 2.)

The left embankment is about 120 ft. long and the crest width varies from 18 ft. at the spillway to about 20 ft. at the left abutment. The upstream slope is covered with heavy random rock riprap grouted with concrete. The crest of the embankment is sodded. The 1 ½ vertical to 1 horizontal downstream slope is also sodded except for a section to the left of a fence near the left abutment. In this area the downstream slope is quite irregular and light brush growth and at least 6 trees approximately 1 ft. in dia. are well established. There are also four trees located to the right of the fence along the downstream slope. The sodded downstream slope to the right of the fence has some areas that have minor erosion. In general the left embankment appeared to be in fairly good condition (See Appendix C, photo nos. 3 & 4).

An MDC sewer line built in the 1930's cuts diagonally across the left abutment from the road to the left of the left abutment and heads into the factory area immediately downstream of the dam. There is a manhole at the toe of the embankment approximately 20 feet to the left of the fence line where the fence line intersects the downstream toe and there is a sewer manhole on the crest of the embankment. At the time of the inspection there was no evidence of any problems with the sewer line.

Two fire hydrants connected to the municipal water supply system are situated on top of the dam. The pressure line connecting the two hydrants is in the reservoir along the upstream slope of the dam. Check valves for the supply line are located at the roadway along the left abutment of the dam.

c. Appurtenant Structures. The overflow section or spillway of the dam is a concrete sillblock with a sloping downstream apron. Both the left and right spillway training walls are constructed of approximately 2 ft. thick rubble masonry with mortared joints. There is also a central concrete pier dividing the spillway into two separate bays (see Appendix C, photo nos. 5 & 6). Both the rubble masonry training walls and central concrete pier are in deteriorated condition with loss of mortar from joints and considerable spalling. Seepage was emanating from several joints of the left training wall. Because of the numerous seeps and the high flow over the spillway at the time of inspection it was not possible to estimate the quantity of seepage. It also appeared that there might be some seepage from the right training wall; however, the high flow over the spillway at the time of inspection made it difficult to clearly establish whether seepage exists (see Appendix C, photo No. 12).

Surmounted on the concrete sillblock of the spillway is a 5 ft. 6 in. high stoplog structure. Each of the spillway bays has provisions for 2 stoplogs bays and 1 spillway sluice gate 5 ft. wide by 4 ft. high. Because of the high flow at the time of inspection the condition of the stoplog structure could not be determined. However, discussions with the owner's representatives indicate that it is well maintained and that the stoplogs are removed frequently in anticipation of heavy runoffs.

A 2 ft. by 3 ft. low level outlet is located in the center of the spillway structure about 17.3 ft. below the top of the dam. It is said not to have been used in the past 20 years and it is doubtful whether it is operative according to the owner's representative.

There is a concrete slab service bridge across the spillway bays. From this service bridge the stoplogs are removed and the 5 ft. by 4 ft. sluice gates are operated. Because of the extensive honeycombing and spalling of the concrete, the service bridge is judged to be in poor condition. (See Appendix C, photo Nos. 13 & 14.)

Along the south reservoir rim there are three outlet facilities used only to supply process water to the mill buildings. The approximate location of these outlet pipes is shown on Drawing B-1, Appendix B. At the junction of the embankment with the right abutment there is a 20 in. dia. outlet pipe with gate valve. This outlet pipe was reported to be in operating condition. About 105 ft. upstream of this outlet pipe there is another intake structure. Here an 18 in. dia. and a 48 in. dia. pipe provide process water for the manufacturing company. These outlet facilities were also reported to be in operating condition (see Appendix C, photo No. 7). Since all three of these outlets connect into closed systems they could not be used as a means to empty the reservoir.

d. Reservoir Area. The reservoir behind the dam is a ponding of the Neponset River. The shoreline around the reservoir appears to be stable with no evidence of slides, movement or distress. Along the south reservoir rim from the right abutment and extending upstream about 365 ft. is a rubble masonry wall (see Appendix C, photo No. 11).

e. Downstream Channel. At the downstream toe of the spillway apron a concrete culvert which is in fair condition carries flows under two roadways and two buildings (see Appendix C, photo No. 8). The culvert emerges about 300 ft. downstream of the dam into the Neponset River. About 300 ft. beyond this point the river passes under a twin masonry arch bridge carrying Washington Street over the Neponset River (see Appendix C, photo Nos. 9 & 10). About 1,500 ft. below Bird

Pond Dam the Neponset River flows over a second dam and a mill complex. A third mill complex is located about 4,400 ft. downstream of Bird Pond Dam. Beyond this third mill complex the Neponset River widens and passes through an urban area for a distance of about 7,000 ft. before entering a large swampy area.

3.2 Evaluation

In general, the visual inspection adequately revealed key characteristics of the dam as they may relate to its stability and integrity, permitting an assessment to be made of those features affecting the safety of the structure. Minor erosion of the downstream slope of the left embankment was evident. Brush growth and several mature trees are well established on the left embankment. Mortar was missing from the spillway training walls and the central concrete pier is deteriorated, as is the spillway service bridge. Seepage was noted from the left spillway training wall and possibly from the right training wall as well. The low level outlet has not been used in 20 years and is presumed inoperative. High flow over the spillway at the time of inspection made it difficult to clearly establish whether seepage exists through the right spillway training wall. There is no regular periodic maintenance program. For these reasons the Dam was judged to be in fair condition.

SECTION 4 - OPERATIONAL MAINTENANCE PROCEDURES

4.1 Operation Procedures

a. General. The dam is owned and operated by Bird & Son, Inc. According to the owner's representatives the water level in the pond is maintained at or above elevation 98.2 so as to provide process water for the mill's operations. The low water elevation for providing process water is 5.7 ft. below the top of dam. The facility however is operated in conjunction with several other manufacturers located along the Neponset River who also require specific water levels for their operations.

b. Description of any Warning System in Effect. No warning system is in effect at Bird Pond Dam.

4.2 Maintenance Procedures

a. General. No regular periodic maintenance program is in effect at Bird Pond Dam. There are however several items which require periodic maintenance such as: the upkeep of sod on the crest and downstream slope of the dam; the removal of growth from the left end of the embankment; the removal of debris from the spillway opening and from the downstream culvert opening; the upkeep of the spillway service bridge; the repair of the spillway training walls; the maintenance of the stoplog structure; the surveillance of the embankment regarding seeps; and, the maintenance of the outlet gates.

b. Operating Facilities. The low level outlet below the spillway has not been used for many years. It is questionable whether it is still operative. There are three outlet pipes, 18 in., 20 in., and 48 in. dia. and gate valves used to supply process water to the mill buildings. These are all reported to be in operating condition. The stoplogs are normally removed in anticipation of high runoffs.

4.3 Evaluation

Overall maintenance of the dam is generally good. Specific maintenance items are evaluated as follows: The sod on the crest of the dam is in good condition while the downstream slope is only fair condition; brush and trees are well established on the left end of the embankment and need to be removed; the spillway and downstream culvert opening are relatively free of debris; the spillway service bridge is in poor condition; there is seepage through the spillway training walls and they are in a deteriorated condition; the stoplog structure is in fair condition; no embankment seeps were evident; and, the outlet gates except for the low level outlet are in operating condition. The owner should establish a formal warning system for the dam in the event of an emergency.

SECTION 5 - EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General

Bird Pond Dam is a run-of-the-river type project, which furnishes process water to a mill located on the right bank and below Bird Pond. It is basically a low storage - high spillage facility. It consists of a concrete overflow section with stoplogs and two sluice gates and earth embankmens on either side of the overflow section. The dam impounds a normal storage of about 113 acre-ft. with provisions for an additional 72 acre-ft. of capacity in its surcharge space to top of dam. With stoplogs installed the spillway is capable of discharging about 500 cfs with the surcharge to the top of the dam. The general characteristics of the 25.1 sq. mi. drainage basin is best described as flat and coastal. The northern part of the drainage area is predominately forested while the southern part consists of woodlands, open fields, swamps, and highly developed urban areas. The Neponset Reservoir is located in the extreme upper reaches of the southern part of the drainage area.

5.2 Design Data

No hydrologic or hydraulic design data was retrieved for Bird Pond Dam.

5.3 Experience Data

During the field inspection it was reported by the owner's representative that during the August, 1955 flood the stage of the pond reached the crest of the dam's earth embankments and that sand bags were placed on the crest to prevent overtopping of the dam. U.S.G.S. Gaging Station 01105000 is located about 8,000 ft. downstream of the dam on the Neponset River. The gaging station has a period of record dating back to October 1939 and Water Supply Papers for the gage show that the maximum recorded discharge at the gage site was 1,490 cfs on August 19, 1955 when the gage height was 14.65 ft. The drainage area above the gage is 35.2 sq. mi. compared with a drainage area of 25.1 sq. mi. above Bird Pond Dam.

5.4 Test Flood Analysis

Bird Pond Dam is about 18.5 ft. high and impounds about 185 acre-ft to the top of dam and is therefore classified as small in size. Because of downstream conditions, the hazard potential is classified as high. In accordance with Recommended Guidelines for Safety Inspection of Dams, the recommended test flood range is one half the probable maximum flood to a full probable maximum flood (PMF). Because of the urban development downstream, the magnitude of the test flood selected as most closely relating to the involved risk was a full PMF.

The NED March 1978 Preliminary Guidelines Memorandum for Estimating Probable Discharges was used for estimating the probable maximum flood peak flow rate. From the Flat and Coastal Regions Curve the test flood discharge was determined to be about 600 CSM or about 15,000 cfs.

Two discharge curves for the dam were computed (see sheets D-5 thru D-8). One curve was computed assuming the stoplogs to be in place and this spillway sluicegates closed as found on the day of inspection, the other curve was computed assuming the stoplogs to be removed and the two spillway sluice gates open. Reservoir area and storage capacity curves and tables are shown on sheets D-3 and D-4, Appendix D. For determining surface areas and surcharge capacities, planimetered areas were taken from contours delineated on U.S.G.S. 2000 ft. per inch quadrangle sheets. However, because of the discharge and low storage capability of the facility, a test flood routing was not performed.

Relative pond water surface elevations are shown below for the two spillways conditions.

Spillway Condition	Flood Magnitude	Water Surface Elevation	Height of Water over top of dam in ft.	Discharge in cfs
Stoplogs in place	PMF (Test Flood)	109.6	5.7	15,000
Stoplogs in place	½ PMF	107.4	3.5	7,500
Stoplogs Removed Gates Open	PMF (Test Flood)	109.2	5.3	15,000
Stoplogs Removed Gates Open	½ PMF	106.8	2.9	7,500

From the above table it can be seen that the project will not pass the test flood without overtopping the dam for either spillway condition. With the stoplogs in place the project can handle only about 3 percent of the test flood without overtopping the embankments. With the stoplogs removed and the two spillways sluice gates open the project can pass about 14 percent of the test flood without overtopping the embankments. It should be noted that the water surface elevation at the time of the test flood could be higher because of the downstream channel capacity.

5.5 Dam Failure Analysis. A breach owing to structural failure of the dam or by piping or sloughing is a possibility. For this analysis a breach was assumed with the water level at the top of dam. The "rule of thumb" method suggested in the Corps of Engineers' March 1978 Guidance Report was used for the breach analysis. With a breach width equal to about 100 ft., an outflow of about 13,900 cfs, including 500 cfs from the spillway would be realized. (See Sheets D-10 thru D-14, appendix D).

Immediately below the dam the Neponset River flows in a closed system for about 300 ft. as it passes under a service road and two mill buildings. At a point 600 ft. downstream of the dam a twin masonry arch structure carries the river under Washington Street. It is estimated the Washington Street roadway restriction would reduce the downstream breach flood surge by as much as 58 percent and would cause severe flooding of the mill complex located just below the dam. About 1,500 ft. below the Bird Pond Dam is a second mill complex with a dam facility. It is estimated that the rise in head on this second dam would be about 6 ft. because of the breach and portions of the mill facility would suffer damages. About 4,400 ft. below the dam is a third mill complex where it is estimated that the breach would cause a rise in water surface of about 4 ft. It is estimated that the additional depth of flooding due to the breach discharge could be as much as 12 ft. at the first mill site, about 4 ft. at the second mill site, and about 2 ft. at the third mill site downstream. Under the spillway full conditions it is estimated that only the first mill site would be flooded and the depth of flooding under those conditions would be about 2 to 3 ft. In the next reach of the river for a distance of 7,000 ft. the river continues to pass through relatively heavy

urban developments. However, the river is wider in this reach and flooding should not be as severe. Beyond this urban development the flood plain widens out significantly and the flood surge should subside in this reach without further damaging effects.

In summary, a breach of the dam could cause flood damage to three industrial complexes, with the possibility of the loss of more than a few lives. (Appendix D, Sheet D-15, shows the area of potential flooding.)

SECTION 6 - EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations

There are no design calculations, as-built drawings or other data which would permit the preparation of structural stability computations. The dam is now stable and is in fair condition. Deficiencies described below and in section 7 should be corrected.

The field investigation revealed the following:

(1) Seepage through the left masonry spillway training wall and possibly through the right training wall.

(2) Need for repointing mortar in the joints of the upstream ends of the masonry spillway training walls.

(3) Need for repair of the spalled and honeycombed spillway service bridge deck.

(4) Brush and tree growth on the left embankment.

(5) Minor erosion of the downstream slope of the left embankment.

6.2 Design and Construction Data

No plan or calculations of value to a stability assessment are available.

6.3 Post-Construction Changes

The only records of any post-construction changes made to the embankments or the spillway are of the 1906 reconstruction of the spillway. There are also limited records of cement grouting of the spillway training walls where they intersect the embankments. This grouting was done in 1979 and was an attempt to eliminate seepage through both the left and right spillway training walls.

6.4 Seismic Stability

The dam is located in Seismic Zone NO. 2 and in accordance with recommended Phase I guidelines does not warrant seismic analysis.

SECTION 7
ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. On the basis of the Phase I visual examination, Bird Pond Dam appears to be in generally fair condition because of the seepage through the left spillway training wall and because the low level outlet has not been operated in many years and is presumed inoperative. The deficiencies revealed indicate that a further investigation should be carried out and that some remedial work is needed. The major concerns of the overall integrity of the dam are as follows:

(1) The spillway can only pass 3 percent of the test flood outflow.

(2) The dewatering facility is inoperative.

(3) There is seepage through the left spillway training wall and possibly through the right training wall.

b. Adequacy of Information. The lack of in-depth engineering data did not allow for a definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history and sound engineering judgement.

c. Urgency. The recommendations and remedial measures enumerated below should be implemented by the owner within one year after receipt of this Phase I Inspection Report.

7.2 Recommendations

It is recommended that the owner should retain the services of a registered professional engineer experienced in the design of earth dams to make investigations and studies of the following, and if proved necessary, to design appropriate remedial works.

(1) Make a detailed hydrologic-hydraulic investigation to assess further the potential for overtopping and the adequacy of the spillway.

(2) Review the use of stoplogs on the spillway crest and determine the feasibility of either eliminating their use altogether, or modifying them to facilitate their quick removal in anticipation of a storm.

(3) Investigate the cause of the seepage through the left spillway training wall.

(4) Determine whether there is seepage through the right training wall.

(5) Inspect spillway and stoplog structure during a period of no flow conditions.

(6) Determine the need to relocate two pressure fire hydrants located on the crest of the dam.

(7) Remove trees, root structures and brush growth from the left embankment and backfill with suitable material.

7.3 Remedial Measures

a. Operating and Maintenance Procedures.

(1) Fill all holes in the embankment with suitable material.

(2) Reshape the eroded downstream slope of the left embankment and provide topsoil and seed.

(3) Repoint with mortar all voids in the upstream ends of the rubble masonry spillway training walls.

(4) Repair spalled and honeycombed concrete in the spillway service bridge deck.

(5) Determine whether the low level outlet is operative and perform any necessary repair work.

(6) Develop a formal surveillance and downstream emergency warning plan, including round-the-clock monitoring during periods of heavy precipitation.

(7) Institute procedures for an annual periodic technical inspection of the dam and its appurtenant structures.

(8) Implement a regular periodic maintenance program.

7.4 Alternatives

There appear to be no feasible alternatives to the above recommendations.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT Bird Pond Dam

DATE April 14, 1980

TIME 1:00 PM

Owner: Bird & Son, Inc.

WEATHER Cloudy

W.S. ELEV. 101.9 U.S. NA DN.S.

PARTY: A/E Representatives

1. Peter B. Dyson
2. Pasquale E. Corsetti
3. Roger F. Berry
4. Carl J. Hoffman
5. William S. Zoino

Owner's Representatives

6. Ross Fallon - Plant Manager
7. James Moylan - Project Engineer
8. John Hayes - Dam Operator
9.
10.

PROJECT FEATURE	INSPECTED BY	REMARKS
1. Hydrologic	Roger F. Berry	LBA
2. Hydraulics/Structures	Carl J. Hoffman	LBA
3. Soils & Geology	William S. Zoino	GZA
4. General Features	Peter B. Dyson	LBA
5. General Features	Pasquale E. Corsetti	LBA
6.		
7.		
8.		
9.		
10.		

LBA - Louis Berger & Associates, Inc.
GZA - Goldberg & Zoino & Associates, Inc.

PERIODIC INSPECTION CHECKLIST

PROJECT Bird Pond Dam DATE April 14, 1980

PROJECT FEATURE Embankment Dam NAME William S. Zoino

DISCIPLINE Geotechnical NAME

AREA EVALUATED	CONDITIONS
DIKE EMBANKMENT	
Crest Elevation	103.4
Current Pool Elevation	101.9
Maximum Impoundment to Date	Unknown
Surface Cracks	None
Pavement Condition	N/A
Movement or Settlement of Crest	None
Lateral Movement	None Noted
Vertical Alignment	Good
Horizontal Alignment	Good
Condition at Abutment and at Concrete Structures	Generally good. However, spillway training walls are in poor condition on upstream end
Indications of Movement of Structural Items on Slopes	Evidence of grouting of voids behind spillway training walls at intersection with embankments
Trespassing on Slopes	None
Sloughing or Erosion of Slopes or Abutments	None
Rock Slope Protection - Riprap Failures	Riprap is in good condition but is very irregular.
Unusual Movement or cracking at or near Toes	None
Unusual Embankment or Downstream Seepage	None Noted
Piping or Boils	None Noted
Foundation Drainage Features	None evident
Toe Drains	None
Instrumentation	None

PERIODIC INSPECTION CHECKLIST

PROJECT Bird Pond Dam DATE April 14, 1980

PROJECT FEATURE Spillway NAME Roger F. Berry

DISCIPLINE Hydraulics/Structures NAME Carl J. Hoffman

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	Good
Loose Rock Overhanging Channel	none
Trees Overhanging Channel	none
Floor of Approach Channel	unknown
b. Weir and Training Walls	
General Condition of Concrete	fair
Rust or Staining	yes
Spalling	yes
Any Visible Reinforcing	yes
Any Seepage or Efflorescence	yes - both walls
Drain Holes	unknown
c. Discharge Channel	
General Condition	fair
Loose Rock Overhanging Channel	none
Trees Overhanging Channel	none
Floor of Channel	unknown
Other Obstructions	none

PERIODIC INSPECTION CHECKLIST

PROJECT Bird Pond Dam DATE April 14, 1980

PROJECT FEATURE Spillway Bridge NAME

DISCIPLINE Structures NAME Carl J. Hoffman

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SERVICE BRIDGE	
a. Superstructure	All concrete
Bearings	N/A
Anchor Bolts	N/A
Bridge Seat	N/A
Longitudinal Members	poor
Underside of Deck	poor
Secondary Bracing	N/A
Deck	deteriorated
Drainage System	N/A
Railings	fair
Expansion Joints	N/A
Paint	N/A
b. Abutment & Piers	
General Condition of Concrete	poor to fair
Alignment of Abutment	good
Approach to Bridge	good
Condition of Seat and Backwall	fair

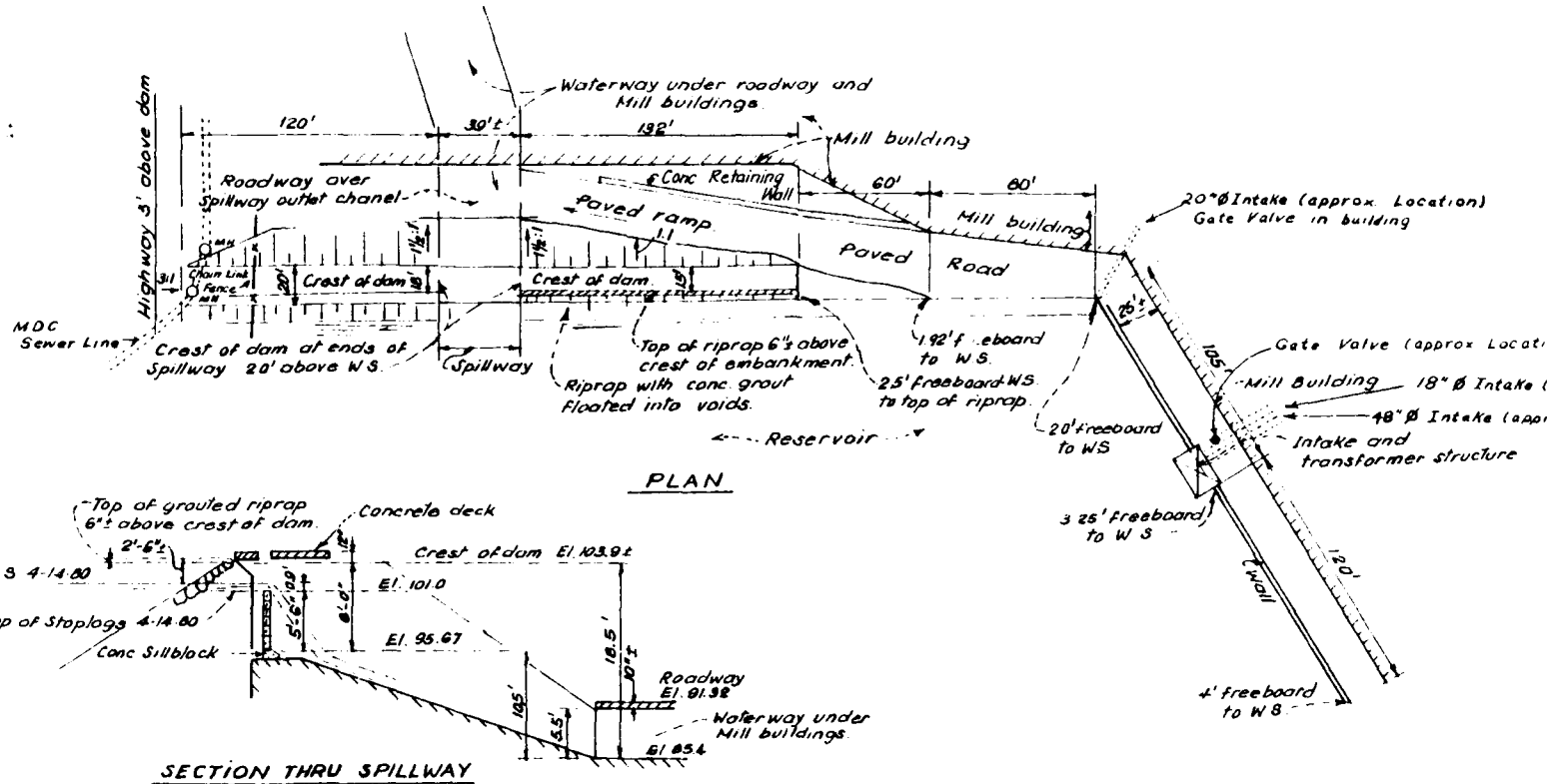
PERIODIC INSPECTION CHECKLIST

PROJECT: Bird Pond Dam DATE: 14 April 1980

AREA EVALUATED	CONDITIONS
Outlet Works - Control Tower	N.A.
Outlet Works - Intake Channel and Intake Structure	N.A.
Outlet Works - Transition and Conduit	N.A.
Outlet Works - Outlet Structure and Outlet Channel	N.A.

APPENDIX B

ENGINEERING DATA



BIRD POND RESERVOIR DAM

E-21870

DRAWN BY W. S. S.

TRACED BY

DATE 10-13-42

MAIN DAM

DAM
GRADES

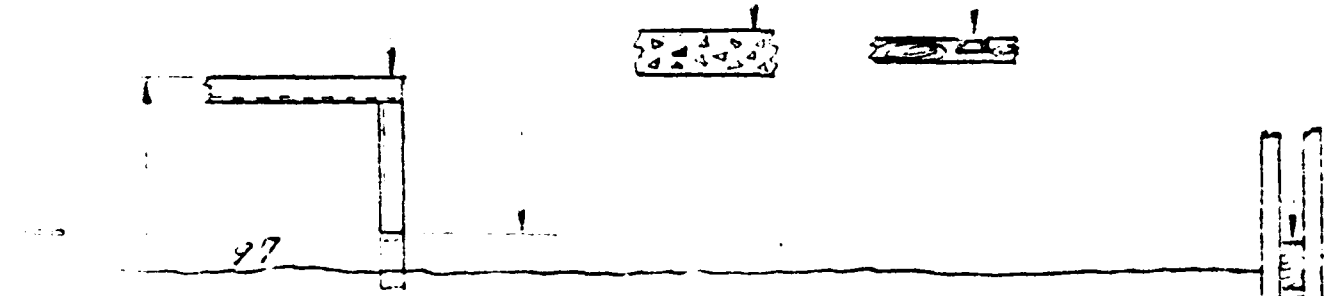
TOP EDGE OF ANGLE SO. E COR. OF POND
G.R. 100.20

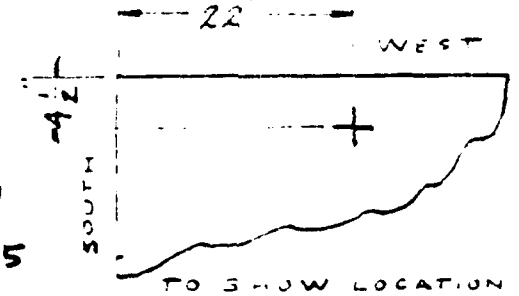
TOP EDGE OF BRASS PLATE ON ANGLE LEG
GR. 98.314

CROSS ON TOP OF CONC WALKWAY OVER DAM
GR. 100.744

TOP OF BRASS PLUG IN TIMBER AT NO. END OF SLOT OVER FLASH BOARDS AT SOUTH END OF DAM
GR 100.6

TOP OF NO END OF FLASH BOARD AT SO. END OF DAM TAKEN AT 2:00 PM 10-12-42
GR. 98.26





TO SHOW LOCATION OF CROSS ON CONC WALKWAY OVER DAM

LOW WATER EL. 95.00

EL. 94.25

EL. 92.89

PUMP

20" INTAKE PIPE ELEV. MEASURED AT END OF PLATFORM

EL. 90.25

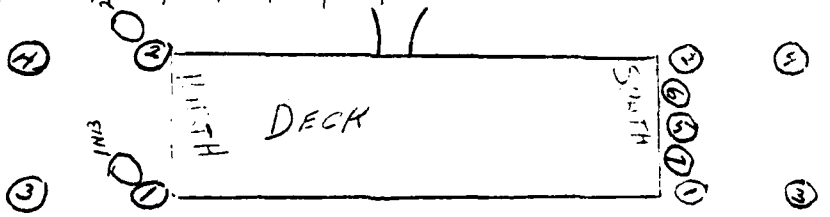
OLD WELL
ADDED 11-13-52

B-2

RAYMOND INTERNATIONAL INC.

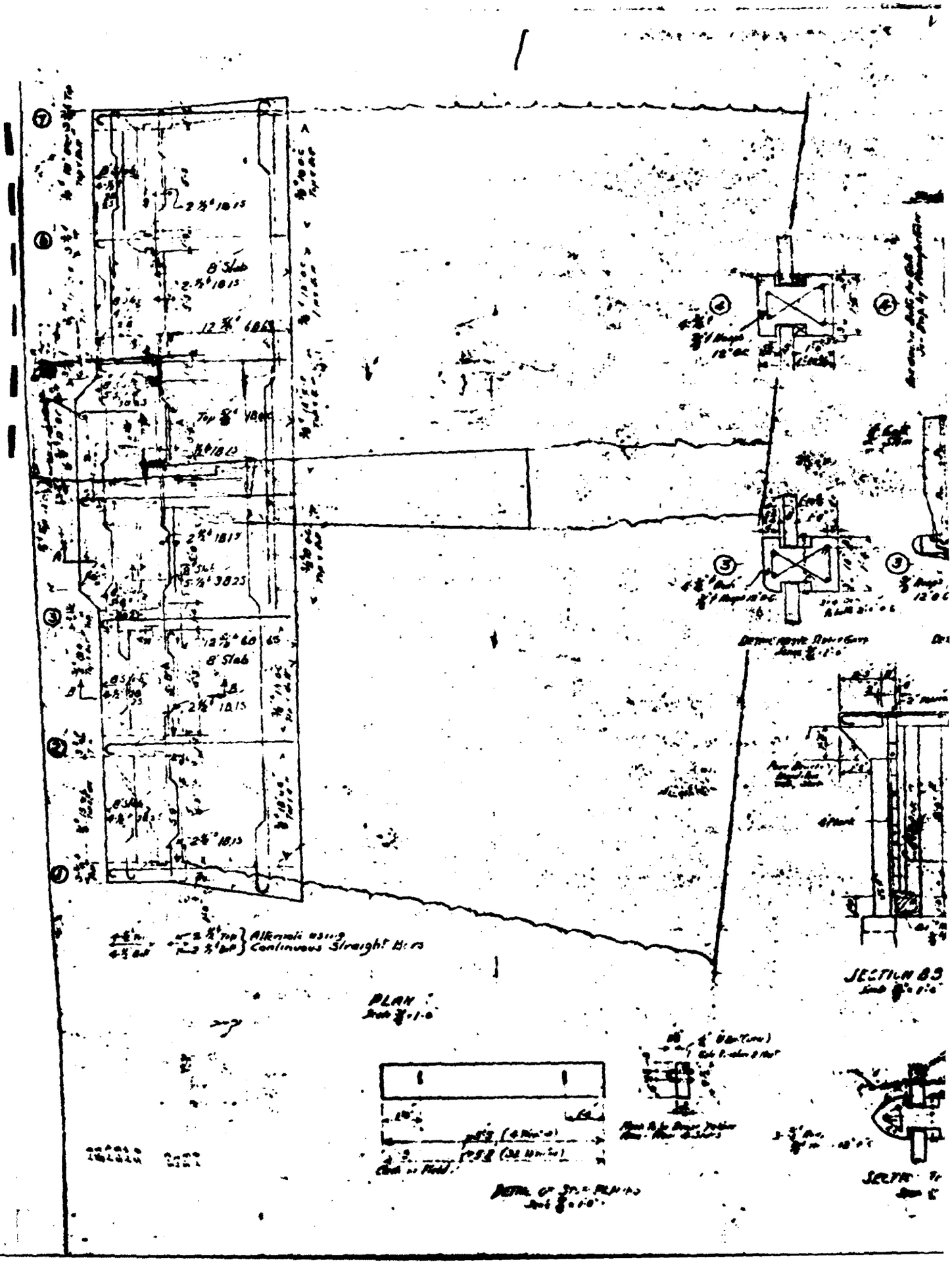
GROUTING RECORD

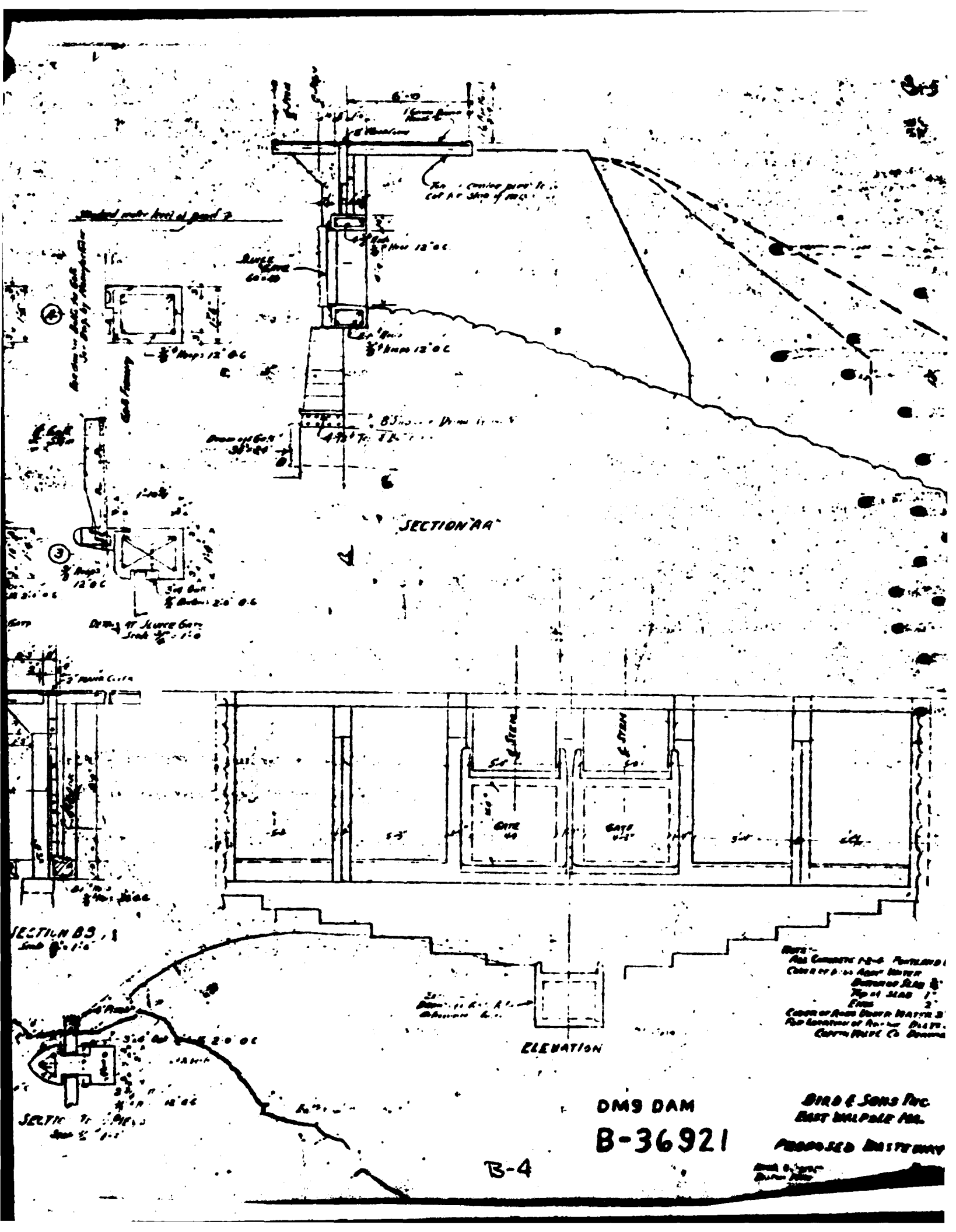
PIPE #	DATE	DEPTH IN FEET	BATCHES	BAGS CEMENT	SAND	VOLUME	RESULTS
1	4-19	8'	2	4	10	16	NOTHING HAPPENED STOPPED FOR LUNCH
2	4-19	7½	7	14	36	78	CAME OUT BETWEEN ROCK STOPPED SOME LEAKS
3	4-19	12	0	0	0	0	CAME UP AROUND PIPE CAULKED AROUND PIPE & GROUT CAME OUT OF GROUND
4	4-19	13	2	4	10	32	HO PSI PULLED PIPE & PIPE BROKE OF AT COUPLING
1	4-19	5'	13	26	65	104	STOPPED MOST LEAKS
5	4-20	13'	23	46	113	182	CAME OUT BETWEEN ROCK IN WALL PUSHED WATER UP TO WITHIN 3' FROM TOP
1-N	4-24	18	5	10	28	43	NO PRESSURE NOTHING
H-N	4-24	15½	3	6	15	24	PRESSURE ALL THE WAY 60 PSI
2-N	4-24	15	4	17		400 GAL	CAME OUT IN MIDDLE OF SPILLWAY
1-N	4-24	18	2	10		200 GAL.	SOME CAME OUT IN MIDDLE OF SPILLWAY FINALLY STOPED & CAME OUT IN BANK
1-N	4-25	10	24	48	120	192	CAME OUT IN MIDDLE OF SPILLWAY
2-N	4-25	10	8	16	40	64	CAME OUT UNDER SPILLWAY RIPRAP
1-N	4-25	8		10			200 GAL SIRGE CAME OUT UNDER SPILLWAY
2-N	4-25	10		5			100 GAL SIRGE CAME OUT UNDER SPILLWAY
1-NB	4-26	14	3	6	12	21	PUMPED 5 BATCHES + GROUT CAME OUT MIDDLE OF SPILLWAY + END OF WALL
2-NB	4-26	14	2	4	8	14	MR FISHER ON JOB DISCUSSED TOP WITH ROSS & WILL FILL MIDDLE OF SPILLWAY PUMPED 20 YARDS READY MIX INTO CENTER HOLE ON SPILLWAY.
	5-1						
2NB	5-2	13	14	28	76	133	CAME OUT UNDER BRIDGE + BASE OF SAND BAGS END OF SPILLWAY
2NB	5-2	13		16		400 GAL.	CAME OUT SAME PLACE SLINGED LEAKS OFF ON WING WALL
3N	5-2	14½	10	20	20	35	HAD (40) PSI PULLED PIPE & GROUT CAME UP AROUND PIPE.
6	5-3	5'	2	4	16	22	CAME UP AROUND PIPE, CAULKED AROUND PIPE + GROUT PUSHED GROUND UP.
7	5-3	5'	1½	3	12	16	SQUIRTED OUT OF HOLE.
	TOTAL	241½	125½	277	582	976	



WATER

DAM


B Slab
Alternate using Continuous Straight Bars
PLAN
SECTION BB


SECTION AA
ELEVATION
SECTION BB
DMS DAM
B-36921
BIRD & SONS INC.
EAST WALPOLE MASS.
PROPOSED WATERWAY
B-4

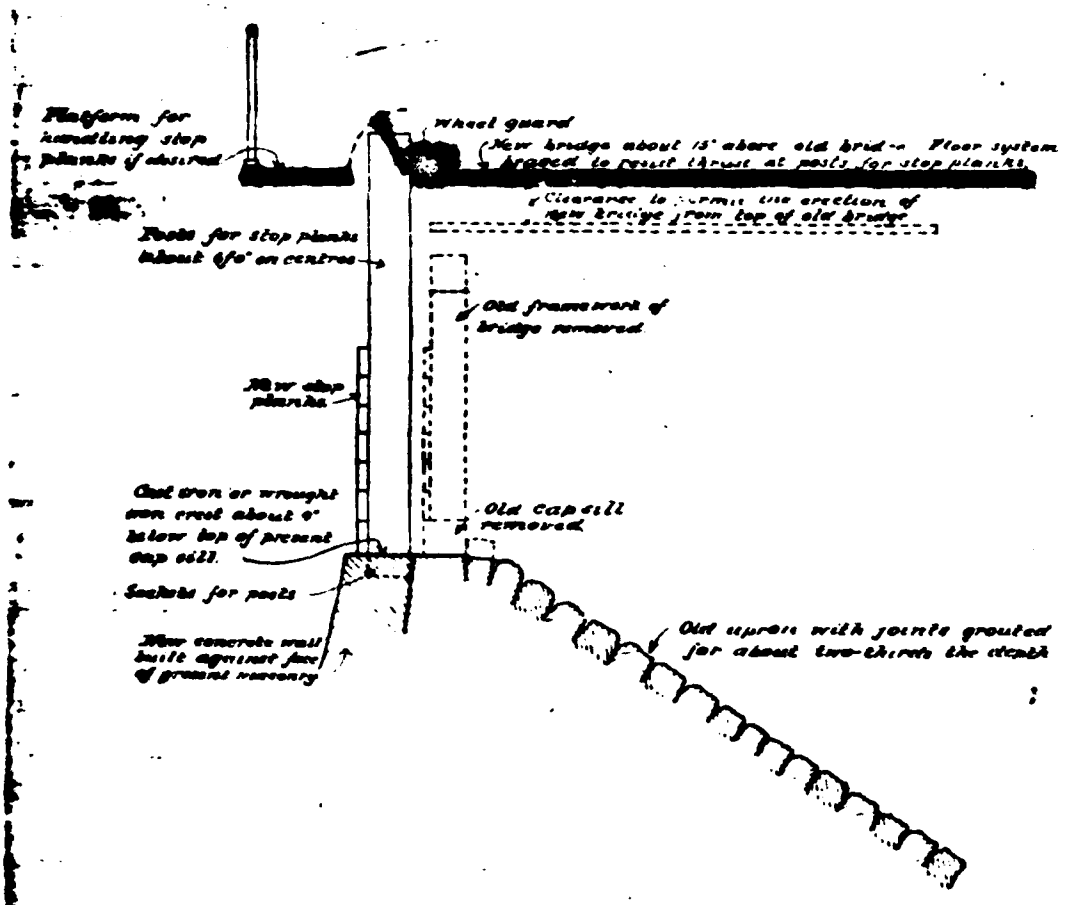
F. W. Bird & Si

Sketch for Reconstruction a

Boston, Mass.
May, 1916.

Cross Section looking N

Not drawn to scale.



F. W. Bird & Son.

for Reconstruction at Wasteway

...ton, Mass.
...ary, 1914.

Elton A. Bush,
Engineer

Cross Section looking North.
Not drawn to scale.

...m to be

B-5

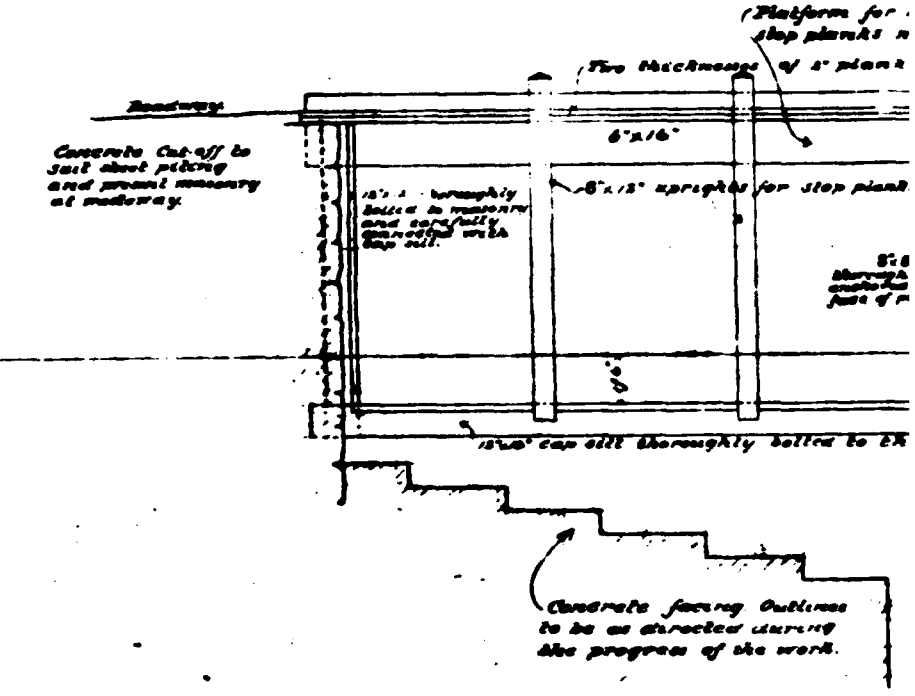
F. W. Bird

Designs for Wa

Boston, Mass.
May, 1904

Scale ½"-

Elevation looking Do



Concrete facing Outlines
to be as directed during
the progress of the work.

F. W. Bird & Son.

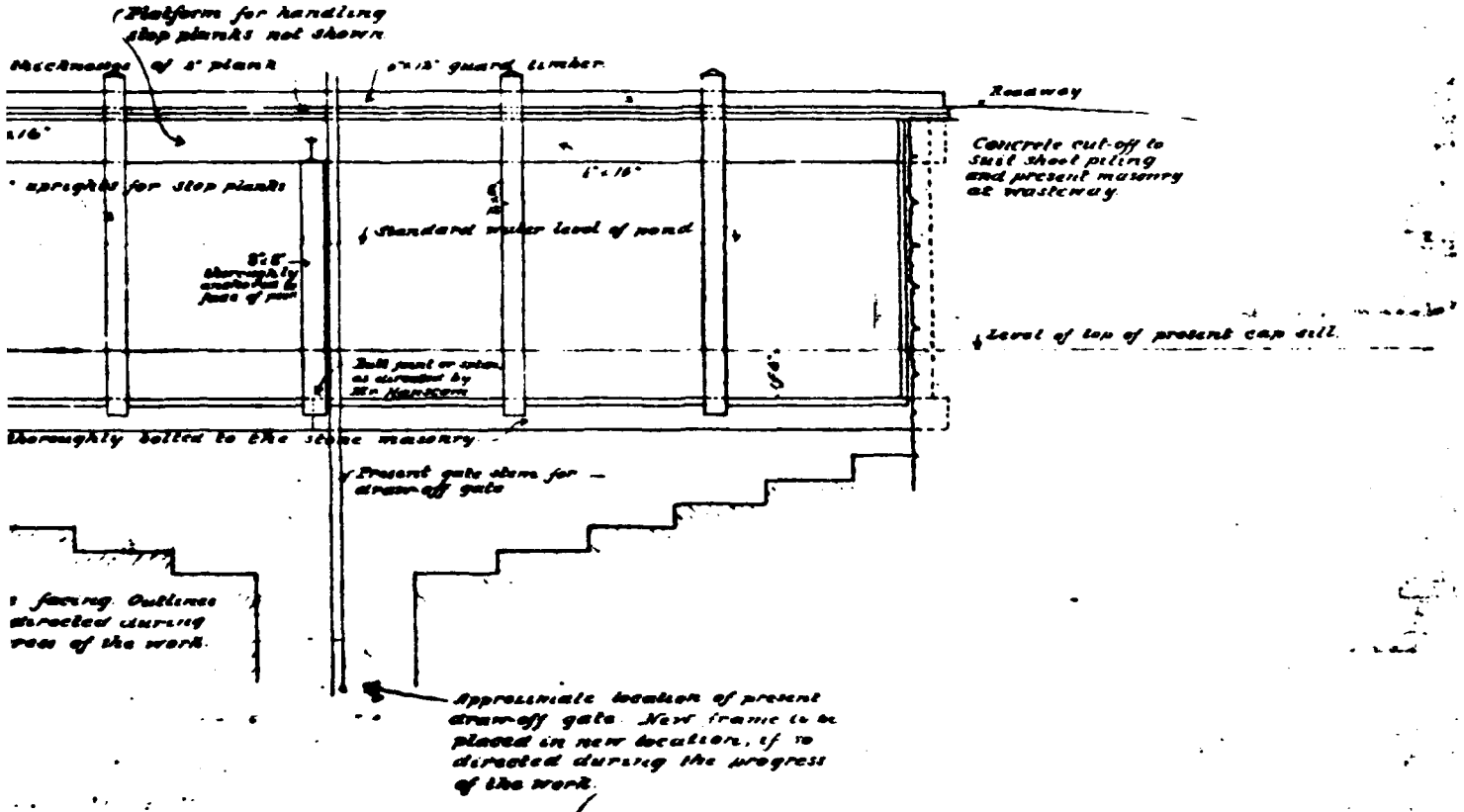
Designs for Wasteway.

ton, Mass.
ray, Mass.

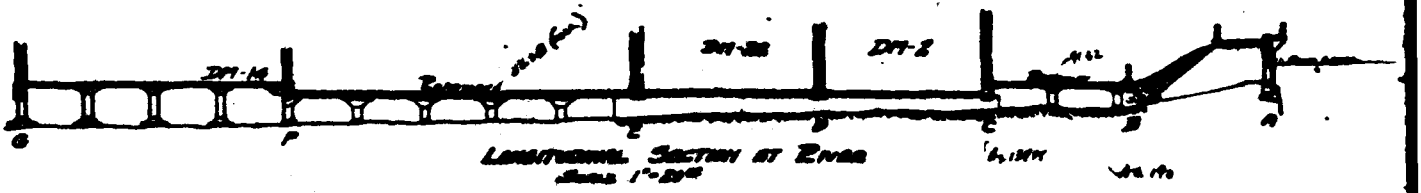
Ethel A. Dunn,
Engineer

Scale ½"-1ft.

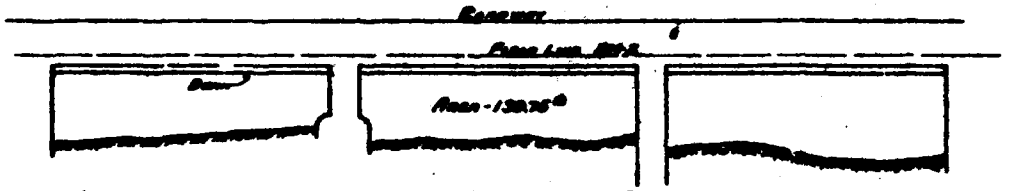
ration looking Down Stream.



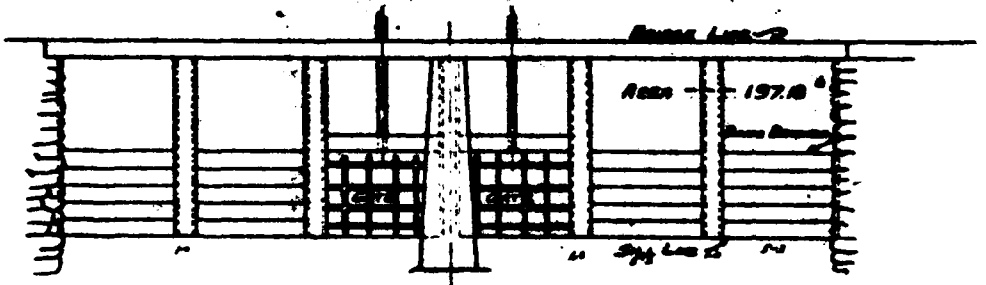
B-6



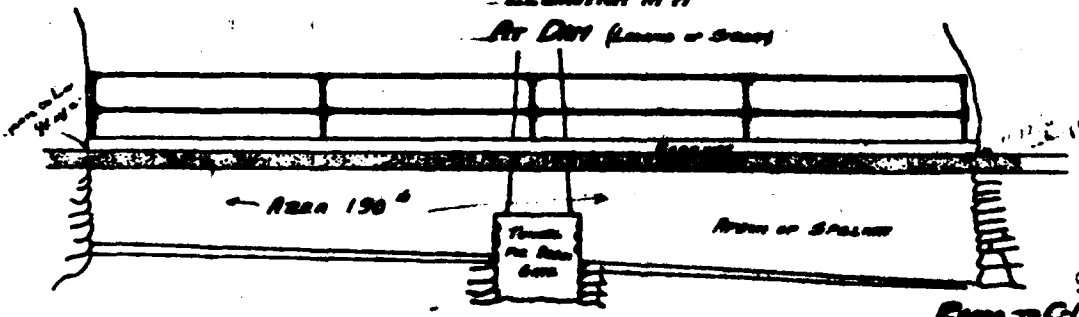
LONGITUDINAL SECTION AT RIVER



ELEVATION AT C
AT WELL - POND SIDE - DIT-2

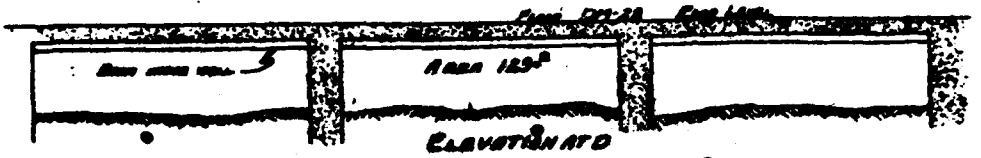


ELEVATION AT A
AT DAM

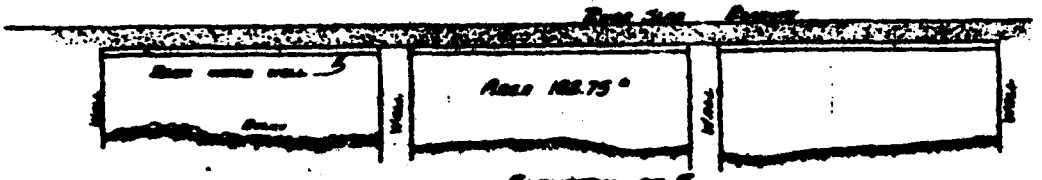


ELEVATION AT B
AT SPILLWAY & BRIDGE

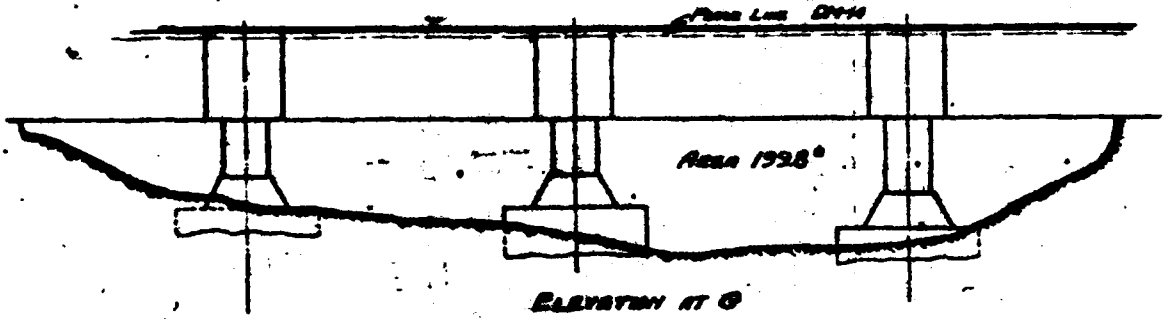
B-7



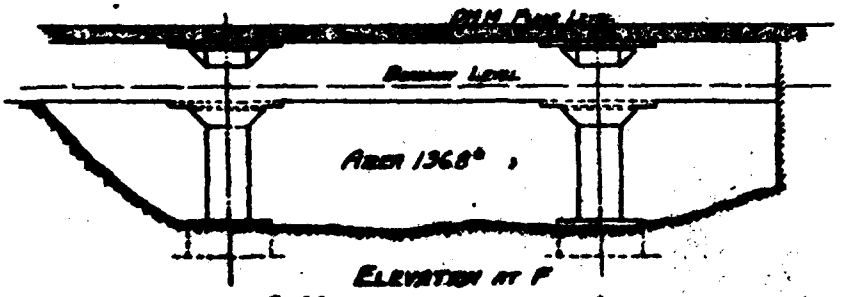
Elevation at D
At wall between DH-2B & DH-2



Elevation at E
At wall down stream side of DH-2B Building

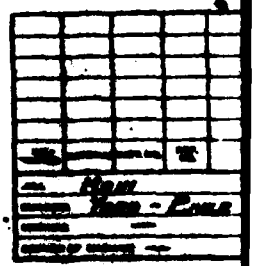


Elevation at G
At wall DH M - Down Stream Side
Looking up stream

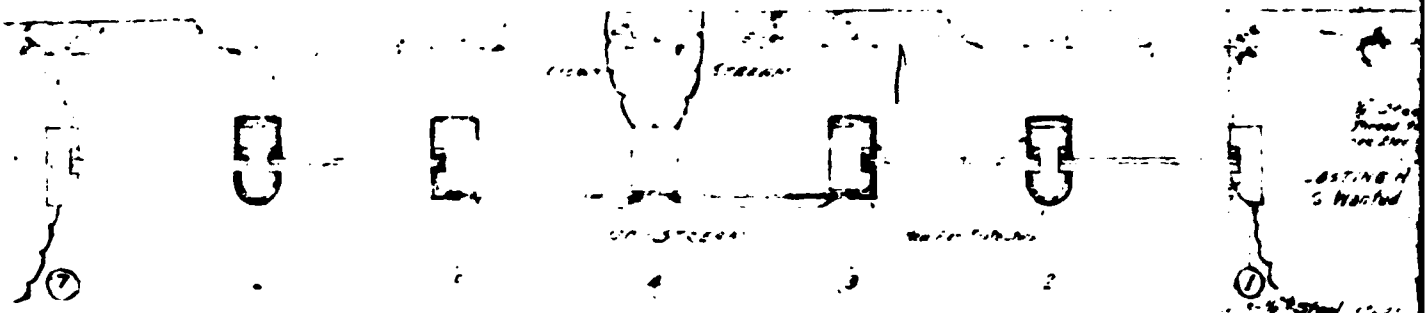


Elevation at F
At Wall DH M - Up Stream Side

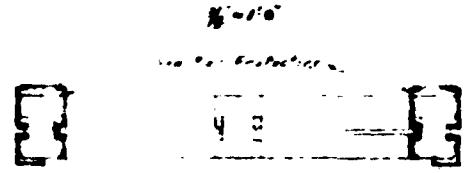
Taken from Plan



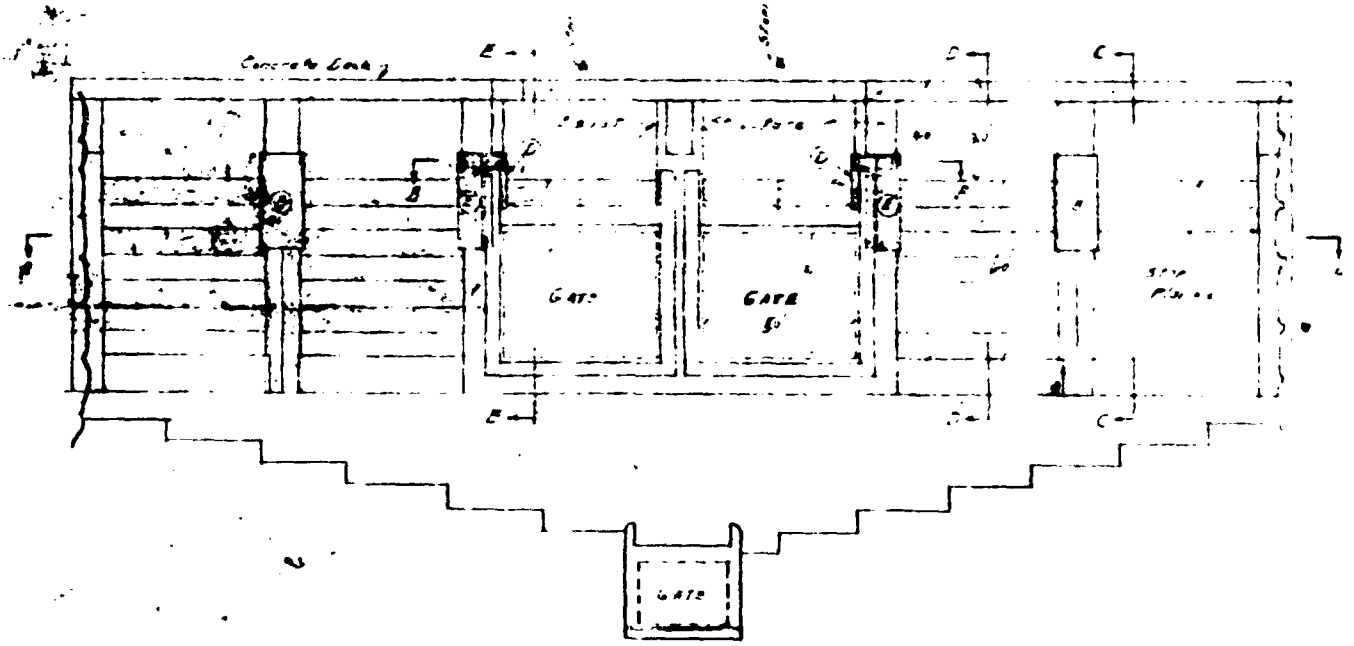
B-B



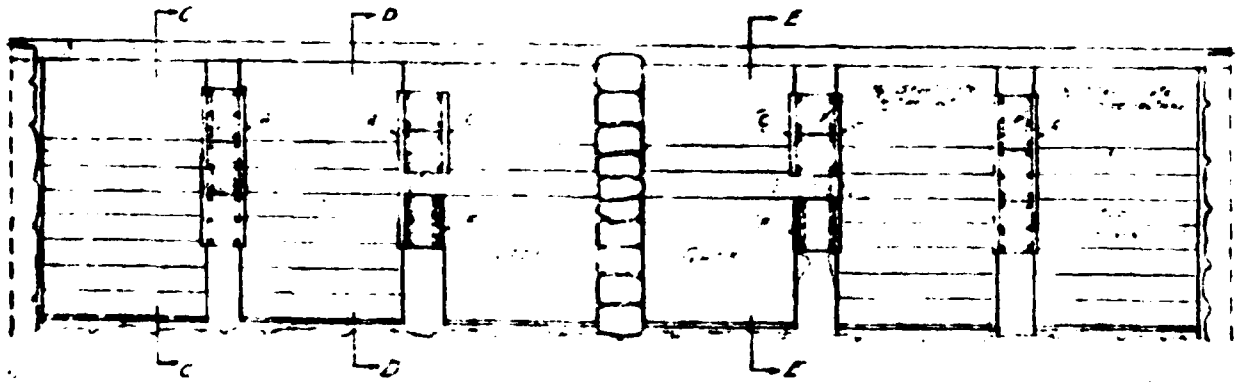
PLAN AT "AA"



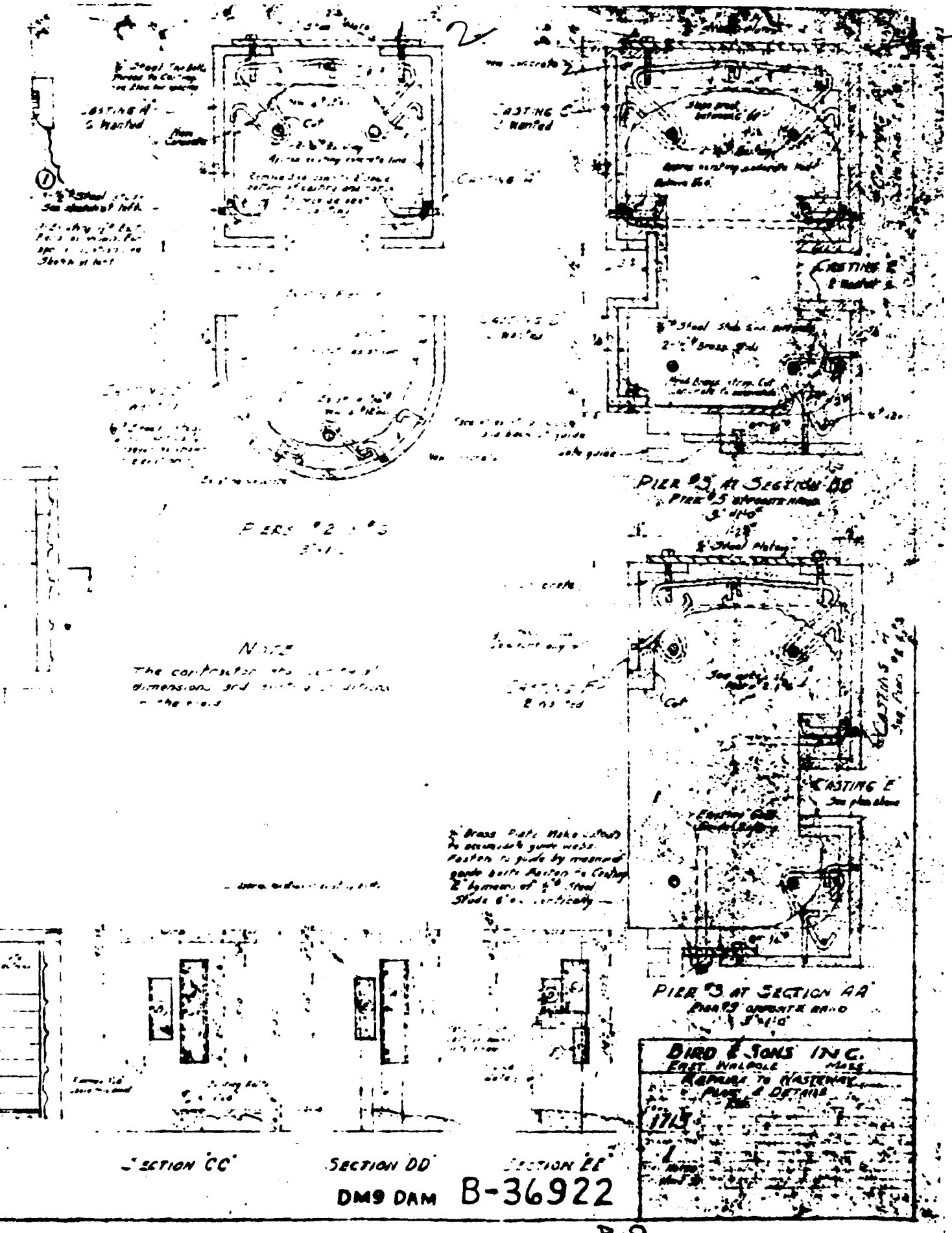
PLAN AT "BB"

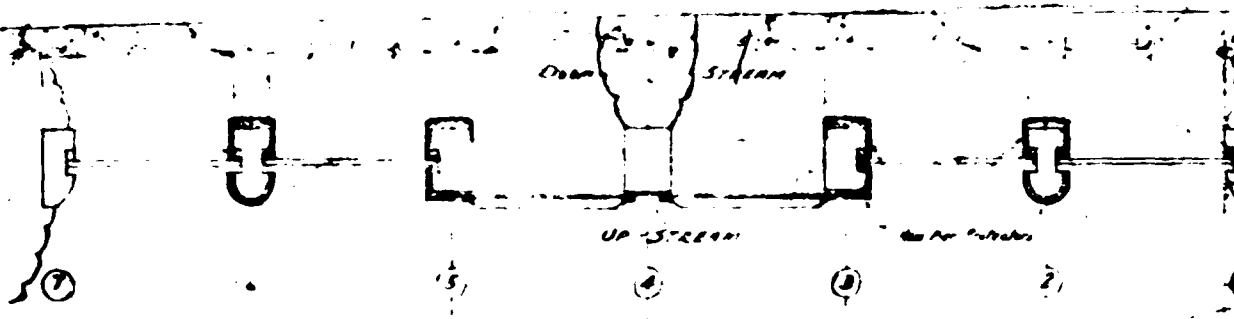


U/S SCREEN ELEVATION

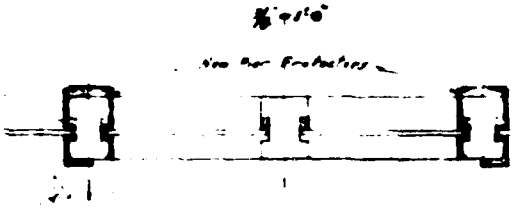


D/S SCREEN ELEVATION

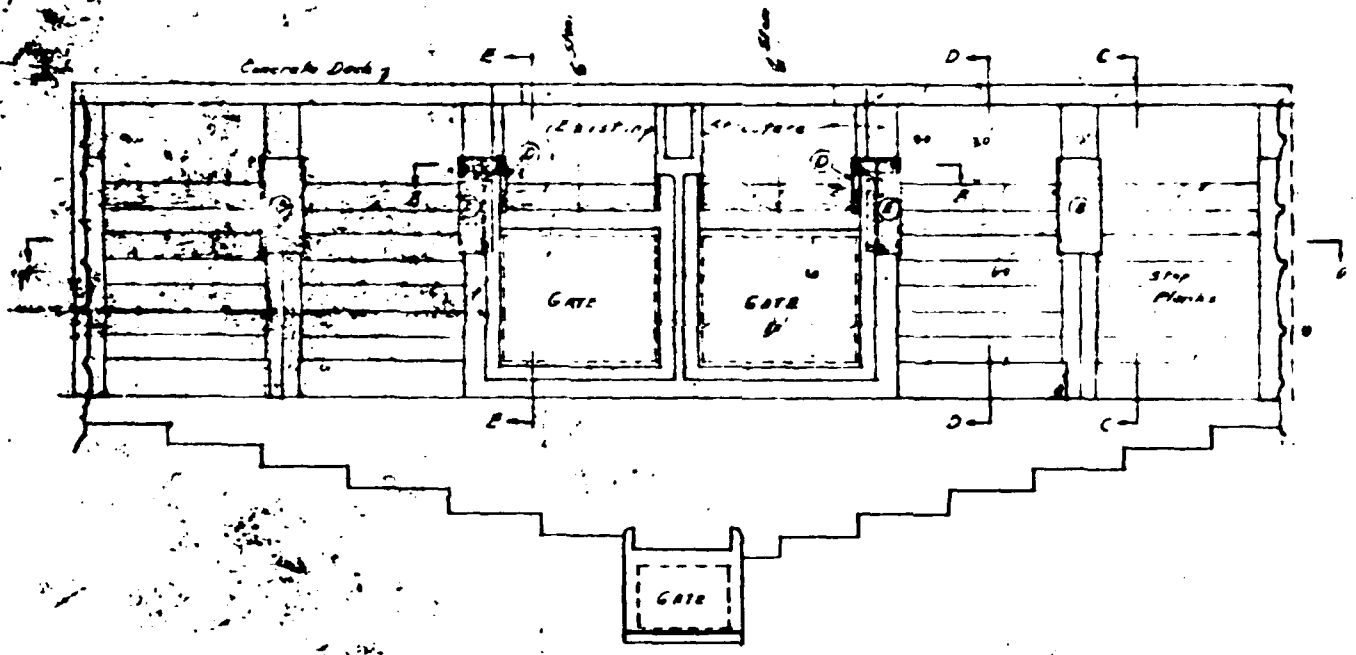

PIER #3 AT SECTION BB
PIER #2 & #3
NOTE
PIER #3 AT SECTION AA
BIRD & SONS INC.
EAST WALPOLE MASS.
REPAIRS TO MASTERNIK
PLANS & DETAILS
1715
1
SECTION CC
SECTION DD
SECTION EE
DM9 DAM B-36922



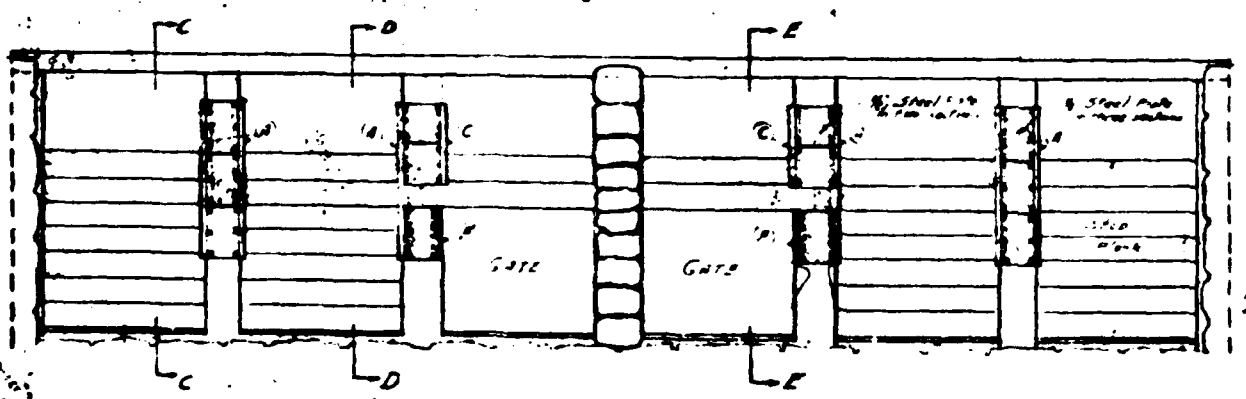
PLAN AT 'AA'
¾"=1'-0"



PLAN AT 'BB'



UP-STREAM ELEVATION
¾"=1'-0"

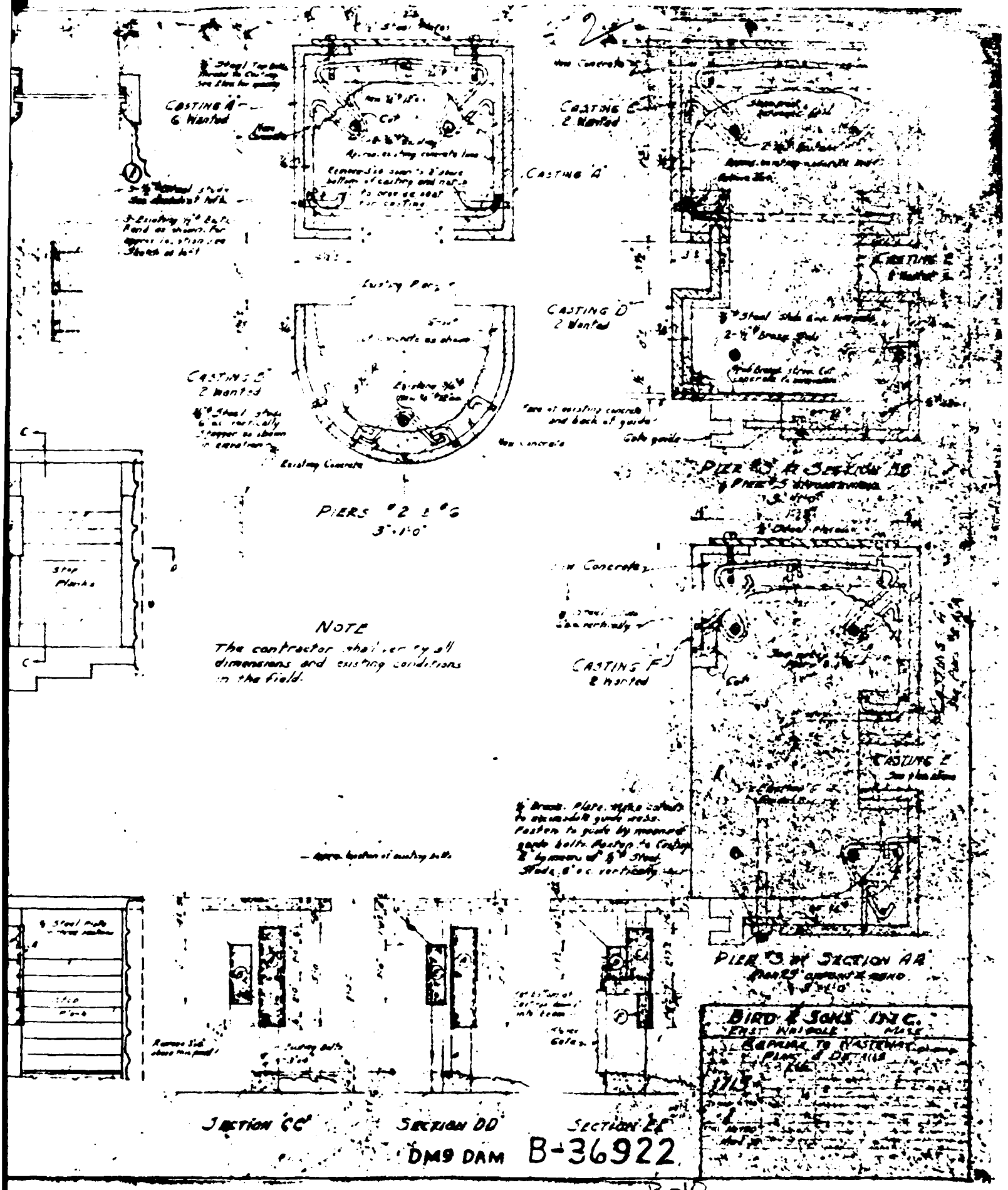


DOWN-STREAM ELEVATION
¾"=1'-0"

Casting C
2 Required

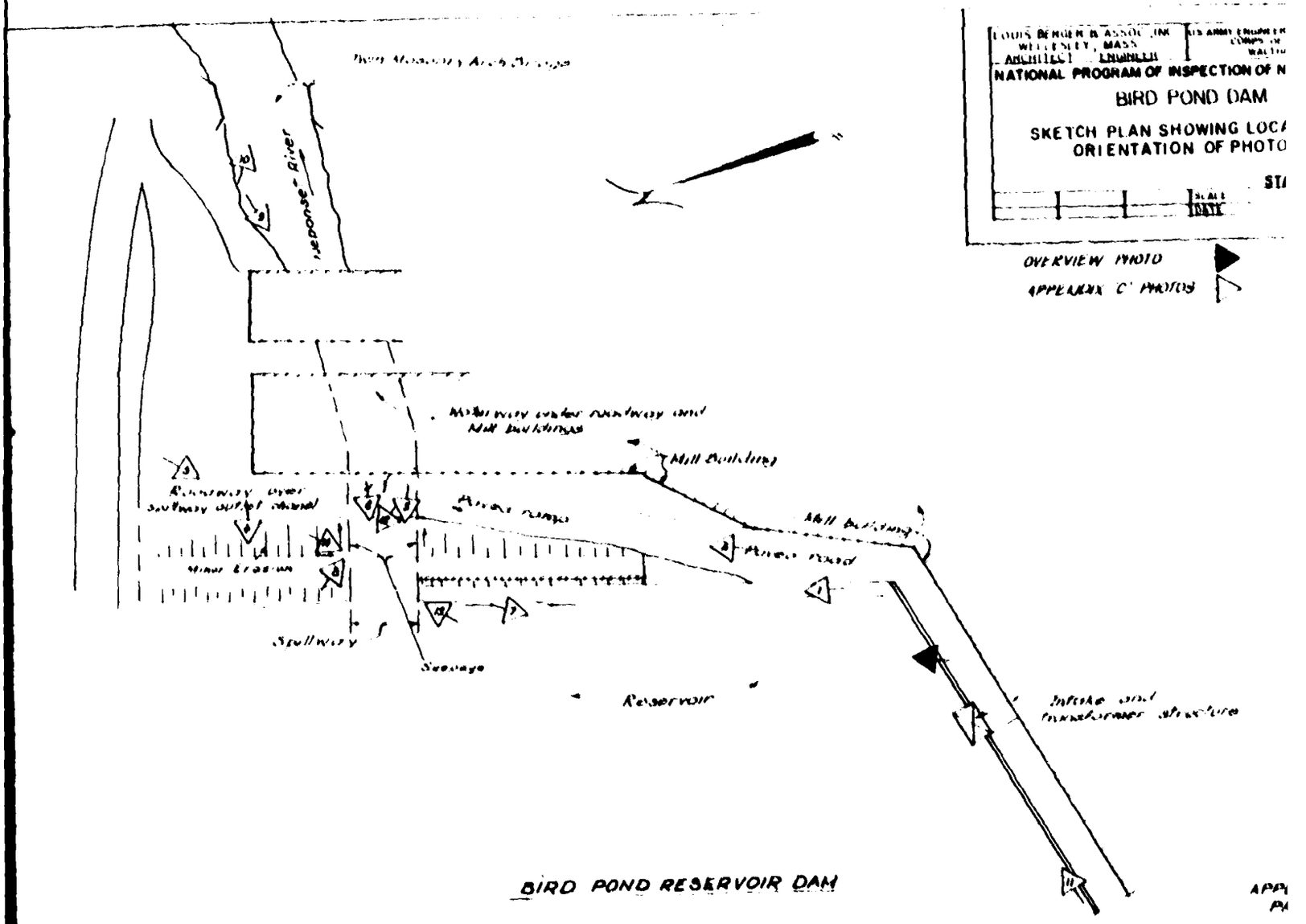
The contra
dimensions
in the field

Section CC

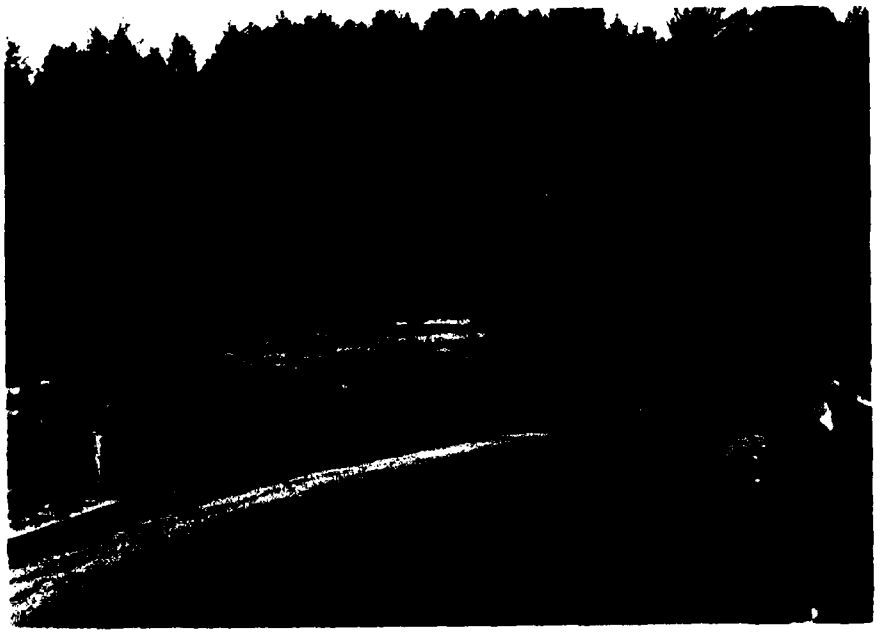

CASTING A
6 Wanted
CASTING C
2 Wanted
CASTING A
CASTING D
2 Wanted
CASTING C
2 Wanted
PIERS #2 & #6
3"=1'-0"
PIER #3 & SECTION BB
PIER #3 SECTION AA
CASTING F
2 Wanted
CASTING E
NOTE
The contractor shall verify all dimensions and existing conditions in the field.
SECTION CC
SECTION DD
SECTION EE
BIRD & SONS INC.
DM9 DAM
B-36922

APPENDIX C

PHOTOGRAPHS


LOUIS BERGER & ASSOCIATES
WELLESLEY, MASS
ARCHITECT ENGINEER
NATIONAL PROGRAM OF INSPECTION OF N
BIRD POND DAM
SKETCH PLAN SHOWING LOCA
ORIENTATION OF PHOTO
OVERVIEW PHOTO
APPENDIX C PHOTOS
Hebronville - River
Mill Building
Mill Building
Spillway
Seepage
Reservoir
BIRD POND RESERVOIR DAM

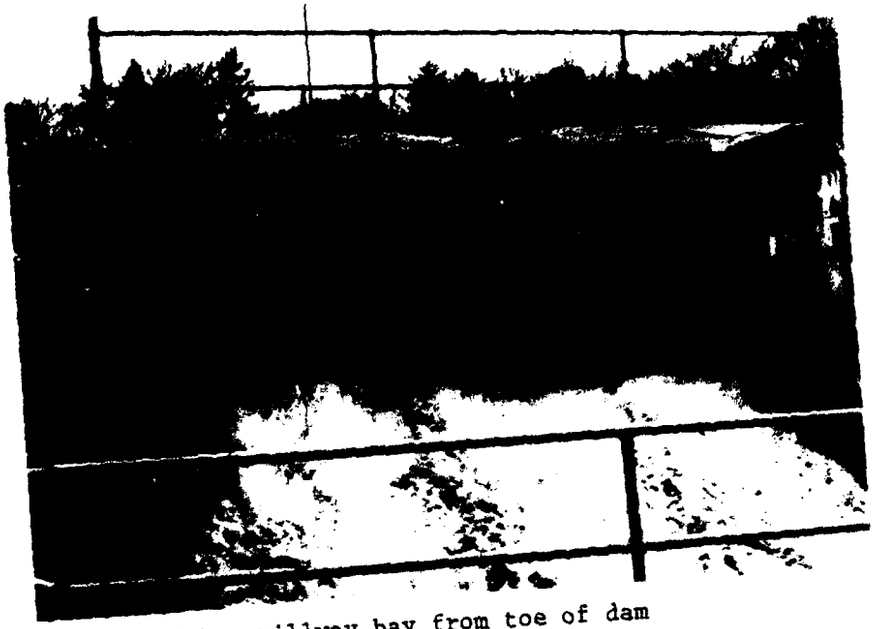
1. View of crest and upstream slope of dam from right abutment



2. View of downstream slope of dam from right abutment

3. Minor erosion on downstream slope of dam and mature tree near left spillway wall.

4. Minor pothole on downstream slope of left embankment



5. View of right spillway bay from toe of dam

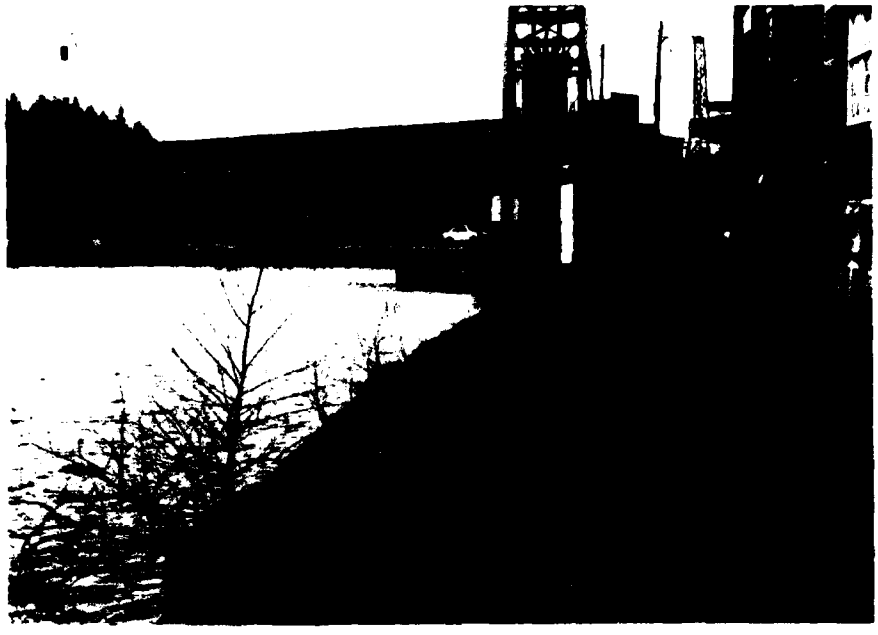
6. View of left spillway bay from toe of dam

7. Bird Pond outlets along rubble masonry wall on south reservoir rim

8. Downstream end of spillway apron and entrance to culvert under mill buildings

9. Culvert outlet about 300 ft. downstream of dam

10. Twin Masonry arch bridge about 600 ft. downstream of dam



11. Rubble masonry wall along south reservoir rim

12. Seepage through left training wall of spillway

13. Upstream face of deteriorated concrete slab over spillway

14. Downstream face of deteriorated concrete slab over spillway

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

BY RFB DATE 3-26-80 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. 1 OF
CHKD. BY DATE INSPECTION OF DAMS PROJECT W-198
SUBJECT Bird Pond H&H

FIND DRAINAGE AREA (NORWOOD QUAD) SCALE 1:24,000

READ #2	79.55	READ #3	191.30	AVE 30.75
" #1	48.80	" #2	79.55	
	30.75		30.75	

(MEDFIELD QUAD) SCALE 1:24,000

AREA 1 READ #2	63.41	READ #3	100.47	AVE 37.065
" #1	26.34	" #2	63.41	
	37.07		37.06	

AREA 2 READ #2	81.76	READ #3	122.50	AVE 40.79
" #1	40.92	" #2	81.76	
	40.84		40.74	

(WRENTHAM QUAD) SCALE 1:24,000

READ #2	53.23	READ #3	91.36	AVE 38.185
" #1	14.99	" #2	53.23	
	38.24		38.13	

(MANSFIELD QUAD) SCALE 1:24,000

READ #2	53.48	READ #3	81.73	AVE 28.30
" #1	25.13	" #2	53.48	
	28.35		28.25	

TOTAL = 175.09 SQ.IN

DRAINAGE AREA = (175.09)(0.1435) = 25.13 SQ MI = 16,080 ACRES

FIND RESERVOIR ELEV 101

READ #2	21.49	READ #3	21.73
" #1	21.25	" #2	21.49
	0.24		0.24

RES AREA = 0.24 (91.83) = 22 ACRES

D-1

BY RFB DATE 3-26-80 LOUIS BERGER & ASSOCIATES INC. SHEET NO. 2 OF
CHKD. BY DATE INSPECTION OF DAMS PROJECT W-198
SUBJECT BIRD POND H&H

AREA AT ELEV 110

READ #2 20.84 READ #3 21.26
" #1 20.41 " #2 20.84
0.43 0.42

AREA @ ELEV 110 = 0.425(91.83) = 39 ACRES

BY RFB DATE 4-24-80 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. 1 OF 1

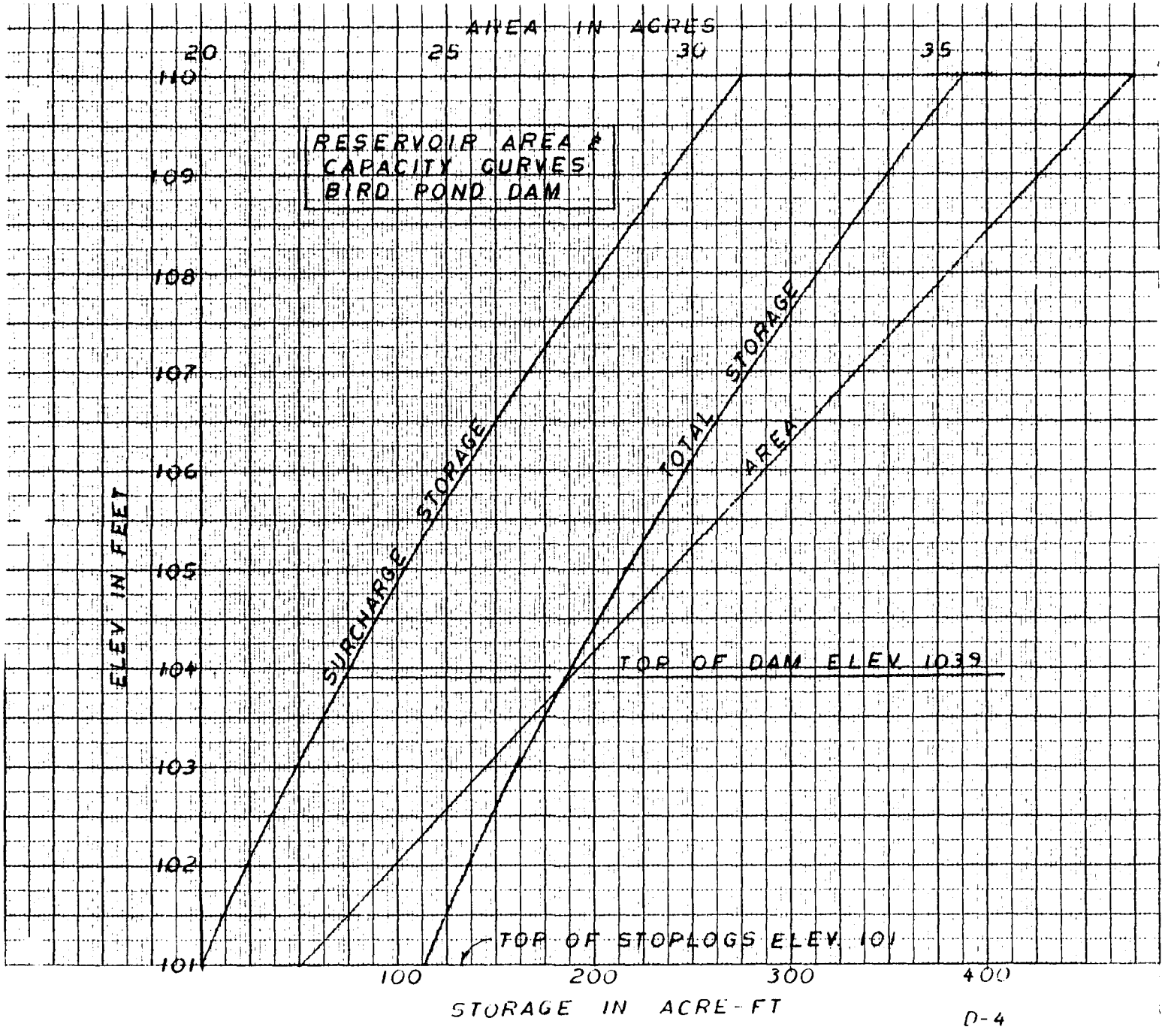
CHKD. BY DATE INSPECTION OF DAMS PROJECT W-198

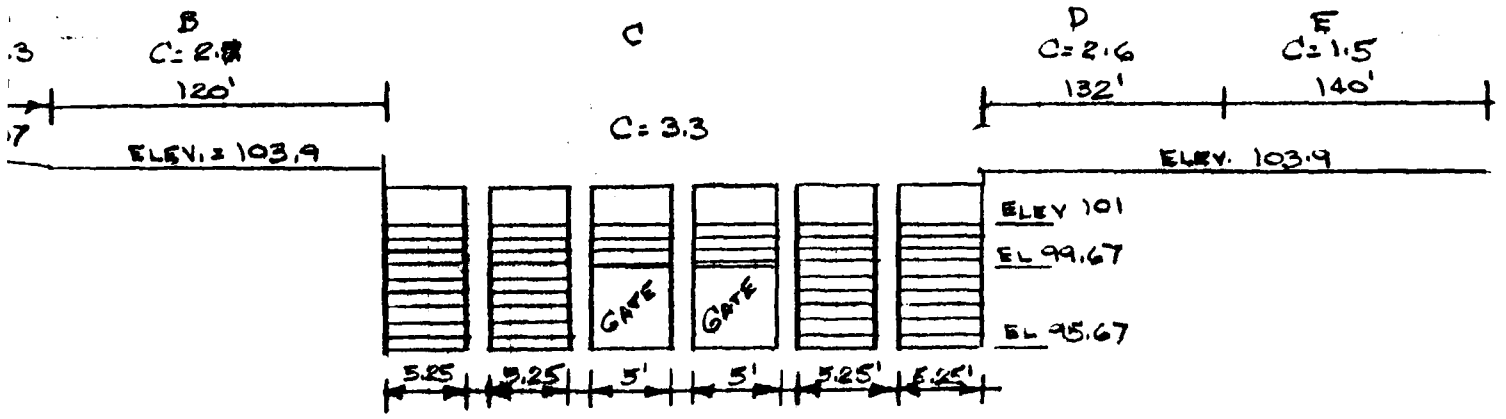
SUBJECT BIRD POND DAM - STORAGE CAPACITY

HEIGTH - STREAM BED TO TOP STOPLOGS = 15.6 FT

VOLUME = A x H x 1/3 = 22 x 15.6 x 1/3 = 113 ACRE-FT

ELEV. FT	AREA SQ. FT	AVE AREA	ΔH	Δ STORAGE	TOTAL STORAGE	SURCHARGE STORAGE
101	22				113	0
102	23.9	22.95	1	23	136	23
103	25.8	24.85		24.8	161	48
104	27.7	26.75		26.8	188	75
105	29.6	28.65		28.6	216	103
106	31.4	30.50		30.5	247	134
107	33.3	32.35		32.4	279	166
108	35.2	34.25		34.2	313	200
109	37.1	36.15		36.2	349	236
110	39	38.05		38.0	388	274


AREA IN ACRES
20
25
30
35
RESERVOIR AREA & CAPACITY CURVES
BIRD POND DAM
110
109
108
107
106
105
104
103
102
101
ELEV IN FEET
SURCHARGE STORAGE
TOTAL STORAGE
AREA
TOP OF DAM ELEV. 1039
TOP OF STOPLOGS ELEV. 101
100
200
300
400
STORAGE IN ACRE-FT



(WITH FLASH BOARDS)

EV.	A, C = 2.3			B, C = 2.7			C, C = 3.3			D, C = 2.6			E, C = 1.5		
T	L	H	Q	L	H	Q	L	H	Q	L	H	Q	L	H	Q
1	~	0	0	120	0	0	31	0	0	137	0	0	140	0	0
2	~	0	0		0	0		1	102		0	0		0	0
3	~	0	0		0	0		2	289		0	0		0	0
0.9	~	0	0		0	0		2.9	505		0	0		0	0
4.5	4.8	.3	2		.6	151		3.5	670		.6	165		.6	98
5	8.9	0.55	8		1.1	374		4	818		1.1	411		1.1	242
5.5	12.9	.8	21		1.6	656		4.5	977		1.6	721		1.6	425
6	16.9	1.05	42		2.1	986		5	1144		2.1	1084		2.1	640
6.5	21	1.3	72		2.6	1358		5.5	1360		2.6	1493		2.6	880
7	25	1.55	111		3.1	1768		6	1503		3.1	1944		3.1	1146
7.5	25	2.05	169		3.6	2213		6.5	1695		3.6	2433		3.6	1434
9	25	3.55	385		5.1	3732		8	2315		5.1	4102		5.1	2419
0	25	4.55	558	120	6.1	4881	31	9	2760	137	6.1	5366	140	6.1	3164

BY [illegible] DATE 4-23-80 LOUIS BERGER & ASSOCIATES INC. SHEET NO. 1 OF [illegible]
CHKD. BY ____ DATE ____ INSPECTION OF DAMS
SUBJECT BIRD POND DAM - DISCHARGE RATING PROJECT W-148

C SECTION WITH FLOSH BOARDS REMOVED & GATES OPEN										SECTION
ELEV.	C = 3.1			SLUICE GATES $Q = \frac{2}{3}\sqrt{2g}\,CL\,(H_1^{3/2} - H_2^{3/2})$						C
FT	L	H	Q	$\frac{2}{3}\sqrt{2g}\,CL$		H_1	H_2	$H_1^{3/2} - H_2^{3/2}$	Q	ΣQ
95.67	21	0	0			0	0	0	0	
96.67		1	96	$\frac{2}{3}\sqrt{2g}\,L = 53.5$		0	0	0	0	96
97.67		2	272			0	0	0	0	272
98.67		3	499			0	0	0	0	499
99.67		4	769	Q	ESCS	0	0	0	0	769
100	21	4.33	587	0.64	34.2	4.33	.33	8.82	302	889
101		5.33	801	0.64	34.2	5.33	1.33	10.77	368	1169
102		6.33	1037	0.65	34.8	6.33	2.33	12.37	430	1467
103		7.33	1292	0.66	35.3	7.33	3.33	13.76	486	1770
103.9		8.23	1537	0.67	35.8	8.23	4.23	14.91	534	2071
104.5		8.83	1708	0.67	35.8	8.83	4.83	15.62	560	2268
105		9.33	1855	0.675	36.1	9.33	5.33	16.19	584	2439
105.5		9.83	2006	0.68	36.4	9.83	5.83	16.74	609	2615
106		10.33	2161	0.68		10.33	6.33	17.27	629	2790
106.5		10.83	2320	0.68		10.83	6.83	17.79	648	2968
107		11.33	2483	0.68		11.33	7.33	18.29	666	3149
107.5		11.83	2649	0.685	36.7	11.83	7.83	18.77	689	3338
109	21	13.33	3168	0.69	36.9	13.33	9.33	20.17	744	3912
110	21	14.33	3531	0.69	36.9	14.33	10.33	21.04	776	4307

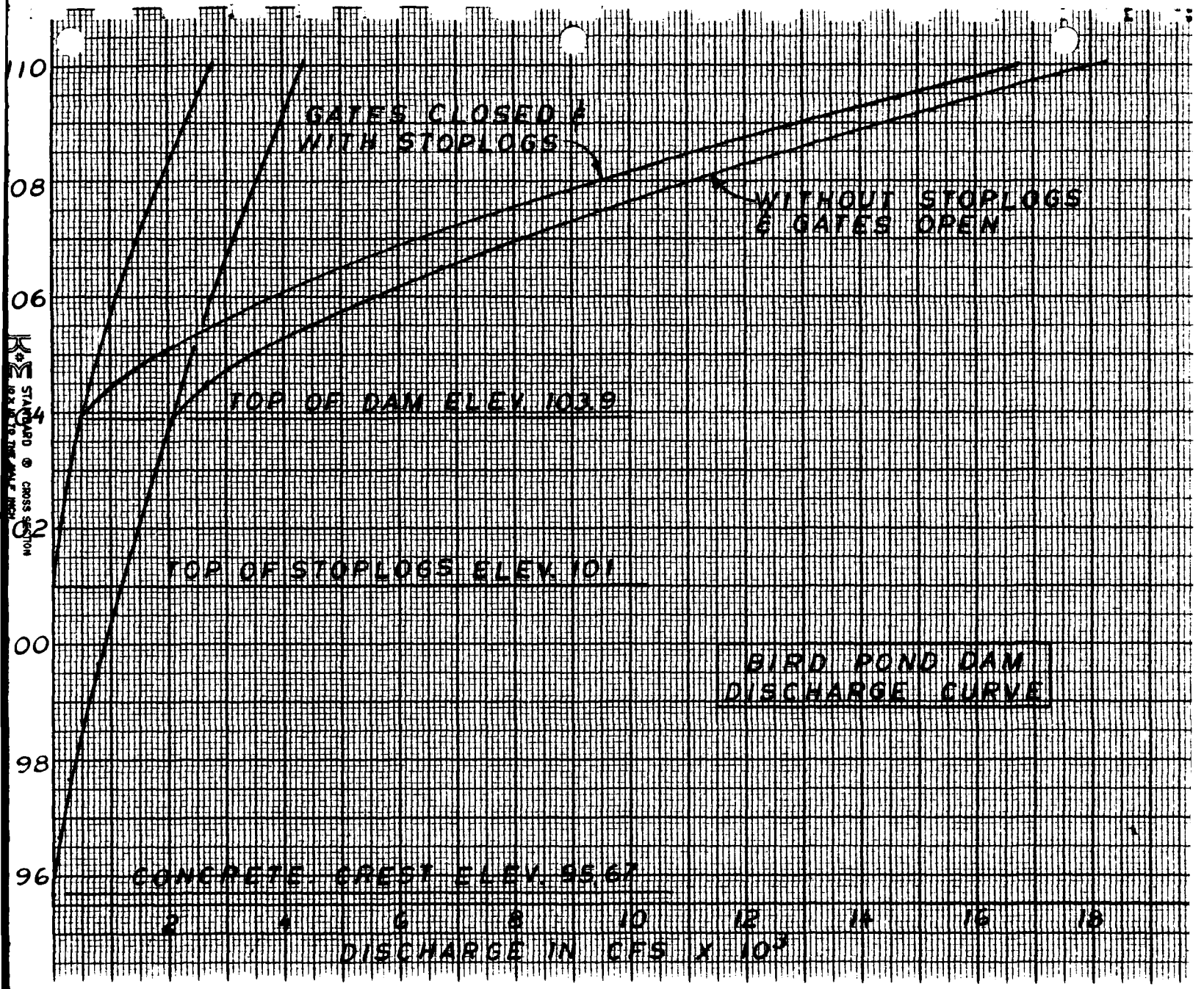
SUBJECT BIG POND DAM - DISCHARGE CURVE CHKD. BY ____ DATE ____ INSPECTION OF DAMS PROJECT W-198

BY RFB DATE 4-24-80 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. 3 OF 3

CHKD. BY ____ DATE ____ INSPECTION OF DAMS PROJECT W-198

SUBJECT BIRD POND DAM - DISCHARGE CURVE

ELEV. FT	WITH FLASHBOARDS ΣQ	WITHOUT FLASHBOARDS ΣQ
95.67	0	0
96.67	0	95
97.67	0	270
98.67	0	500
99.67	0	770
100	0	590
101	0	1170
102	100	1470
103	290	1770
103.9	505	2070
104.5	1080	2680
105	1850	3470
105.5	2800	4440
106	3900	5540
106.5	5120	6770
107	6470	8120
107.5	7940	9590
109	12950	14550
110	16730	18280


GATES CLOSED & WITH STOPLOGS
WITHOUT STOPLOGS & GATES OPEN
TOP OF DAM ELEV. 103.9
TOP OF STOPLOGS ELEV. 101
CONCRETE CREST ELEV. 95.67
BIRD POND DAM DISCHARGE CURVE
110
08
06
04
02
00
98
96
2
4
6
8
10
12
14
16
18
DISCHARGE IN CFS X 10³
STANDARD @ CROSS SECTION

BY REB DATE 4-2-80 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. 1 OF

CHKD. BY DATE INSPECTION OF DAMS PROJECT W-198

SUBJECT BIRD POND - DEVELOPMENT OF TEST FLOOD

DRAINAGE AREA = 25.1 SQ. MI
SIZE CLASSIFICATION = SMALL
HAZARD CLASSIFICATION = HIGH
INSPECTION FLOOD = 1/2 PMF TO FULL PMF

CALCULATE PMF USING "PRELIMINARY GUIDANCE FOR ESTIMATING MAXIMUM PROBABLE DISCHARGE IN PHASE I DAM SAFETY INVESTIGATIONS, MARCH 1978".

FROM FLAT & COASTAL CURVE

MPF PEAK FLOW = 600 CFS/MI^2

FOR 25.1 SQ. MI $\therefore$ PMF = 600(25.1) $\cong$ 15,000 CFS

1/2 PMF = 7,500 CFS

BY REB DATE 4-25-80 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. 1 OF 6
CHKD. BY DATE INSPECTION OF DAMS PROJECT W-198
SUBJECT BIRD POND DAM - FAILURE ANALYSIS

ASSUME DAM FAILS WHEN WATER LEVEL IS AT TOP OF OF DAM ELEV 103.9

STORAGE @ ELEV 103.9 , S = 185 ACRE-FT

ASSUME LENGTH TO FAIL IS 40% OF TOTAL LENGTH OF EARTH EMBANKMENT

W = 40% OF (120 + 132) ≅ 100 FT

H = Y_o = 18.5

$Q_{P_1} = 8/27\ W\sqrt{g}\ Y_o^{3/2}$

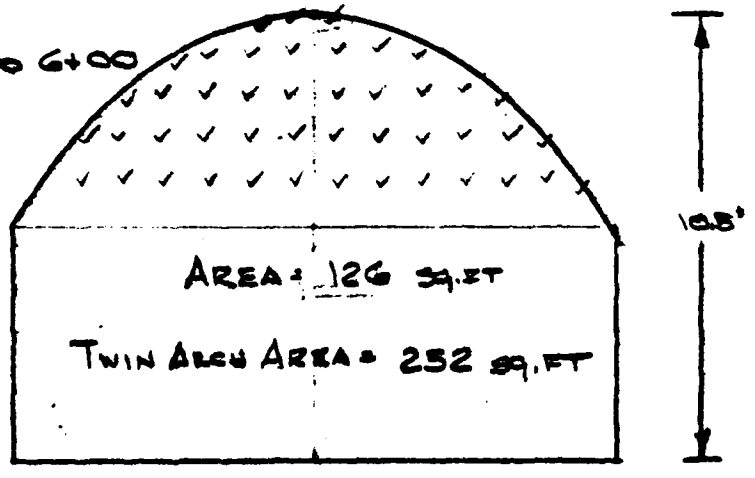
$Q_{P_1} = 1.68 \times 100 \times 18.5^{3/2} = 13{,}368$ CFS

$Q_{SPILLWAY}$ = 505 CFS

TOTAL Q_{P_1} = 13,368 + 505

SAY Q_{P_1} = 13,900 CFS

REACH No.1
STA 0+00 TO 6+00



WASHINGTON ST CROSSING
SCALE 1/4 INCH = 1 FT, 1 SQ = 1 SQ.FT
D-10

FIND VELOCITY THRU TWIN ARCHES FOR Q_{P1}

$$V = \frac{13,900}{252} = 55 \text{ FT/SEC} \qquad \frac{V^2}{2g} = 47 \text{ FT}$$

NOT POSSIBLE, WATER SURFACE WILL SEEK LEVEL OF RESERVOIR SURFACE

FIND WHAT MAXIMUM DISCHARGE CAN BE PASSED THRU ARCH, INVERT OF ARCH IS ABOUT 81 FT
MAXIMUM HEAD UPSTREAM OF ARCHS = 104-81 = 23 FT
OR SAY $Y = \hat{=}$ 23 FT, WHICH IS ABOUT TO TOP OF BRIDGE.

HEIGHT OF WATER - HEIGHT OF ARCH = $1.5 h_v$
23.0 − 10.5 = 12.5 FT, WHERE h_v = VELOCITY HEAD

$$h_v = \frac{12.5}{1.5} = 8.3 = \frac{V_2}{2g} \therefore V = \left(8.3 \times 2 (32.2)\right)^{1/2}$$

$$V = (535)^{1/2} = 23 \text{ FT/SEC}$$

SAY VELOCITY THROUGH ARCHS = 23 FT/SEC

$$Q_{P2} = VA = 23(252) = 5796 \text{ CFS}$$

REACH 2 STA 6+00 TO 15+00

AT STA 15+00 IS DAM AT MILL SITE
ASSUME OVERFLOW SECTION IS COMPATIBLE WITH BIRD POND DAM, NO NON OVERFLOW SECTION BECAUSE OF MILL BUILDINGS

$$\text{FOR } Q = 5800 = CLH^{3/2} \therefore H^{3/2} = \frac{5800}{CL} = \frac{5800}{3.3(50)}$$

$$H^{3/2} = 35 \qquad H = 10.7 \text{ FT}$$

For Spillway $Q = 505$ cfs

$$Q = 550 = CLH^{3/2} \therefore H^{3/2} = \frac{505}{CL} = \frac{505}{3.3(50)}$$

$$H^{3/2} = 3.06 \qquad H = 2.1 \text{ ft}$$

Now find Q_{p2}

$$V_1 = \frac{(10.7 - 2.1)(900 \times 350)}{43{,}560} = 62 \text{ acre-ft}$$

$$Q_{p2\,(TRIAL)} = 5800\left(1 - \frac{62}{185}\right) = 3856$$

For $Q = 3856 = CLH^{3/2} \therefore H^{3/2} = \frac{3856}{3.3(50)}$

$$H^{3/2} = 23.4 \qquad H = 8.2$$

$$\Delta H = 8.2 - 2.1 = 6.1$$

$$V_2 = \frac{(6.1)(900 \times 350)}{43{,}560} = 44 \text{ Acre-ft}$$

$$V_{AVE} = \frac{62 + 44}{2} = 53 \text{ Acre-ft}$$

$$Q_{p2} = 5800\left(1 - \frac{53}{185}\right) = 4{,}140 \text{ cfs}$$

Sta 15+00 to 44+00

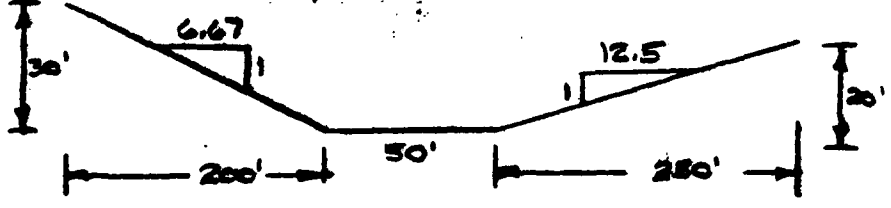
$$Q = \frac{1.486}{n} AR^{2/3} S^{1/2}$$

$$Q = 1735\, AR^{2/3}$$

$$S = \frac{10}{6000} = .00167$$

$$S^{1/2} = .0408$$

$n = 0.045$

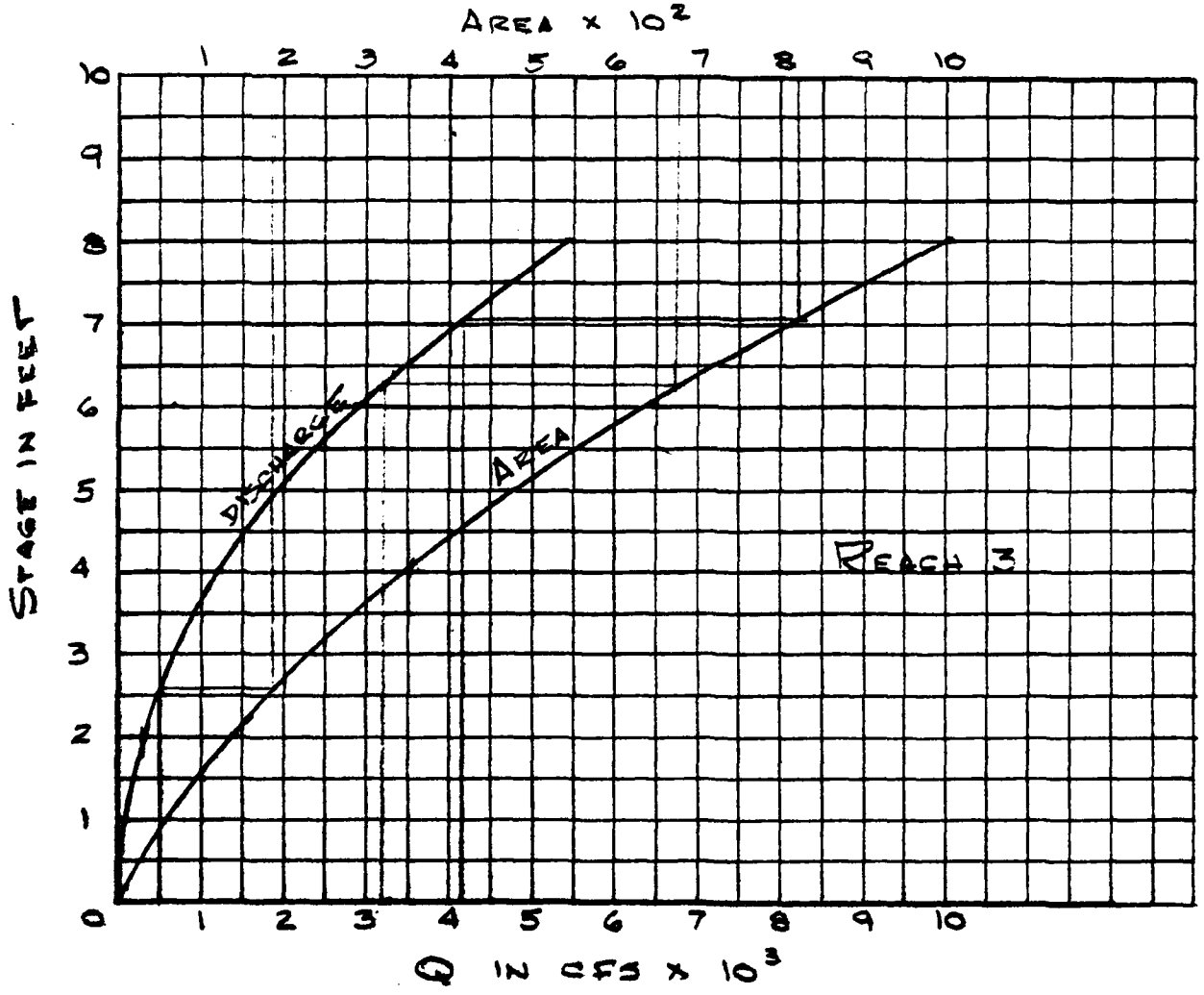


BY REB DATE 4-25-80 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. 4 OF 6

CHKD. BY ____ DATE ____ INSPECTION OF DAMS PROJECT W-98

SUBJECT BIRD POND DAM - FAILURE ANALYSIS

STAGE	AREA	P	R	$R^{2/3}$	Q
2	138	69.6	1.98	1.58	294
4	353	89.2	3.96	2.50	1191
6	645	108.8	5.93	3.28	2856
8	1013	128.4	7.89	3.97	5429
10	1458	148.1	9.84	4.60	9054



For $Q = 4,140$, $V = \frac{820 \times 2900}{43,560} = 54.6$

For $Q = 505$, $V = \frac{180 \times 2900}{43,560} = 11.9$

$V_1 = 54.6 - 11.9 \cong 43$

D-13

$$Q_{P2\,(TRIAL)} = 4140\left(1 - \frac{V_1}{5}\right) = 4140\left(1 - \frac{43}{185}\right)$$

$$Q_{P2\,(TRIAL)} = 3180$$

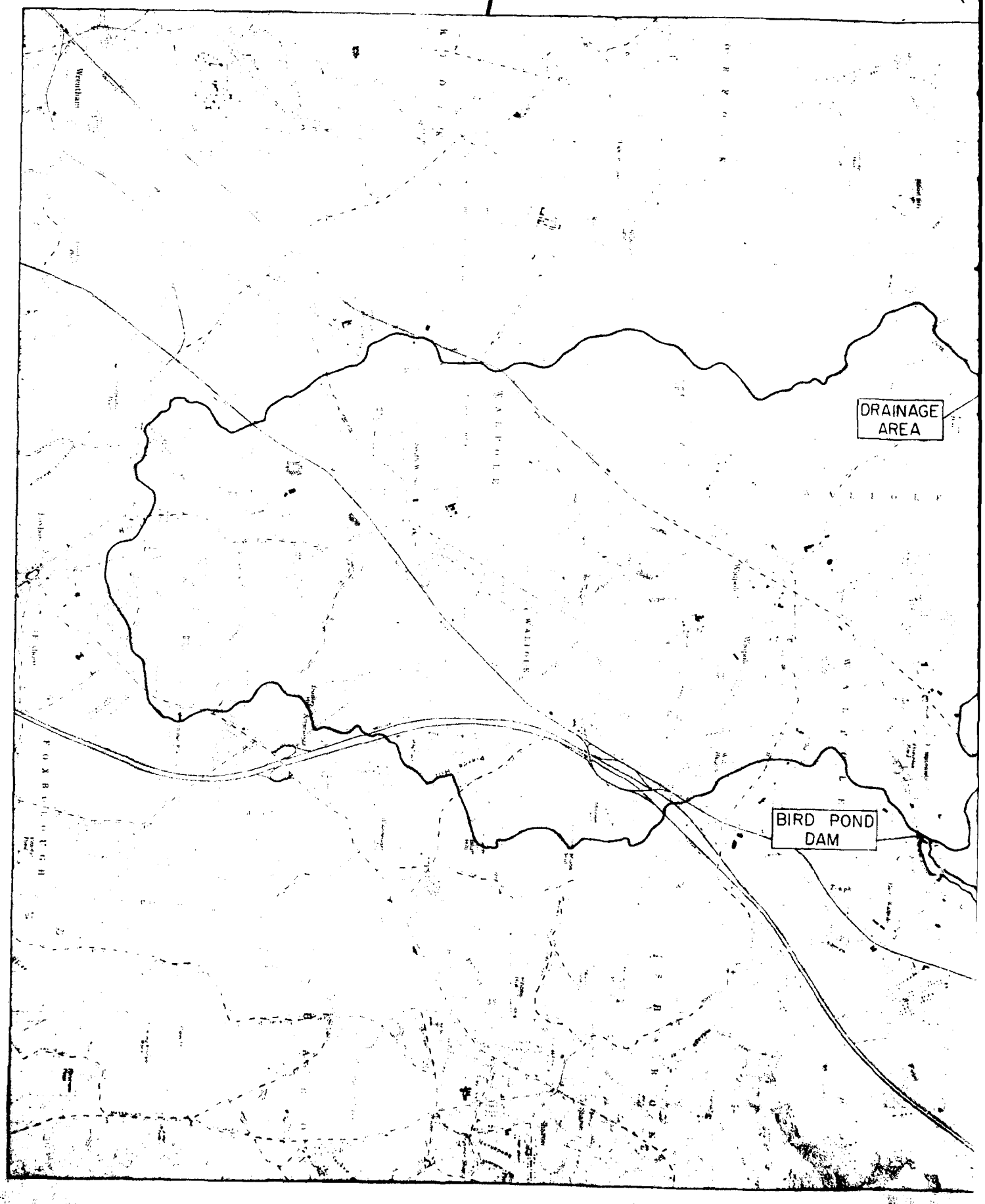
For $Q = 3180$, $V = \frac{675 \times 2900}{43{,}560} = 44.9$

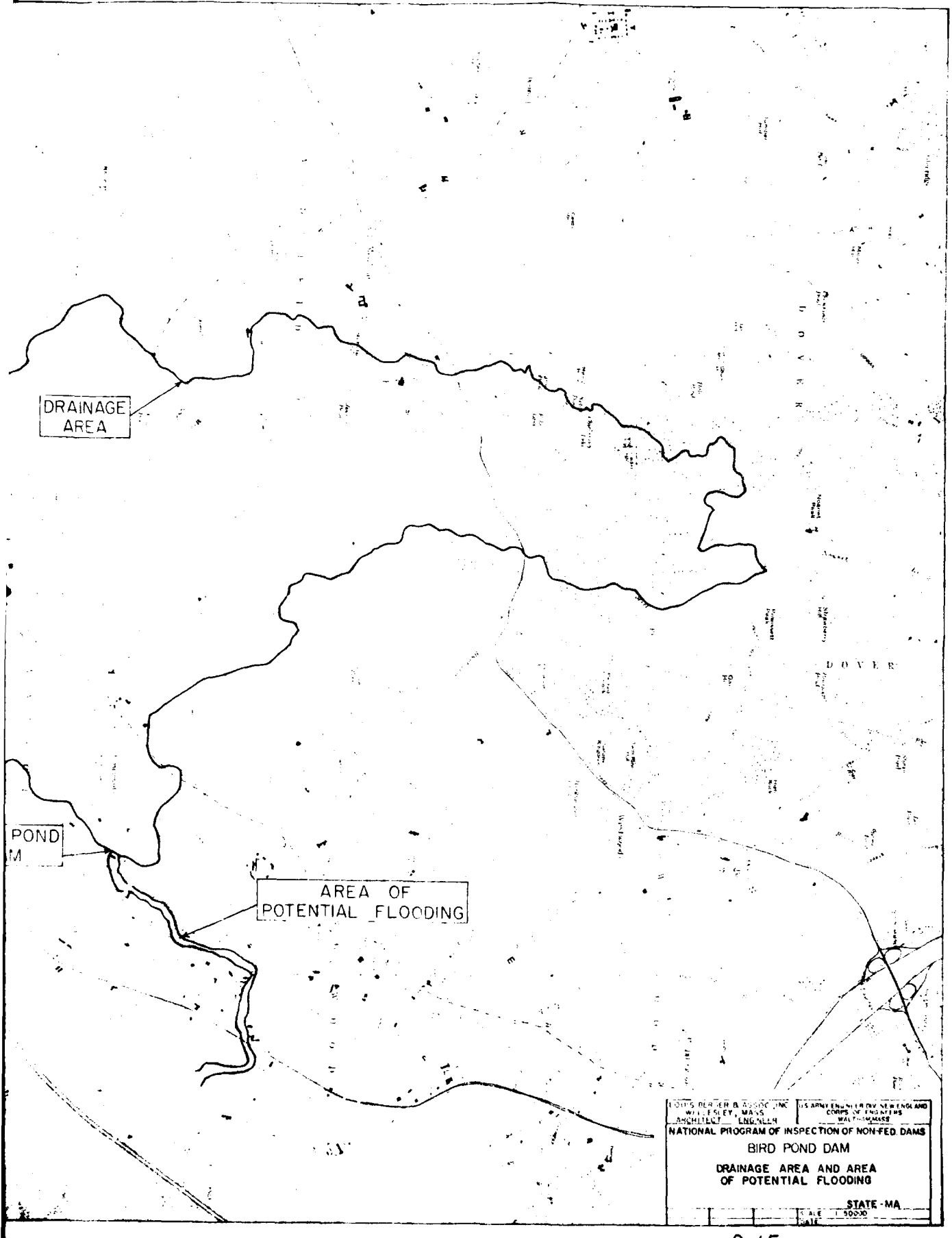
$$V_2 = 44.9 - 11.9 = 33$$

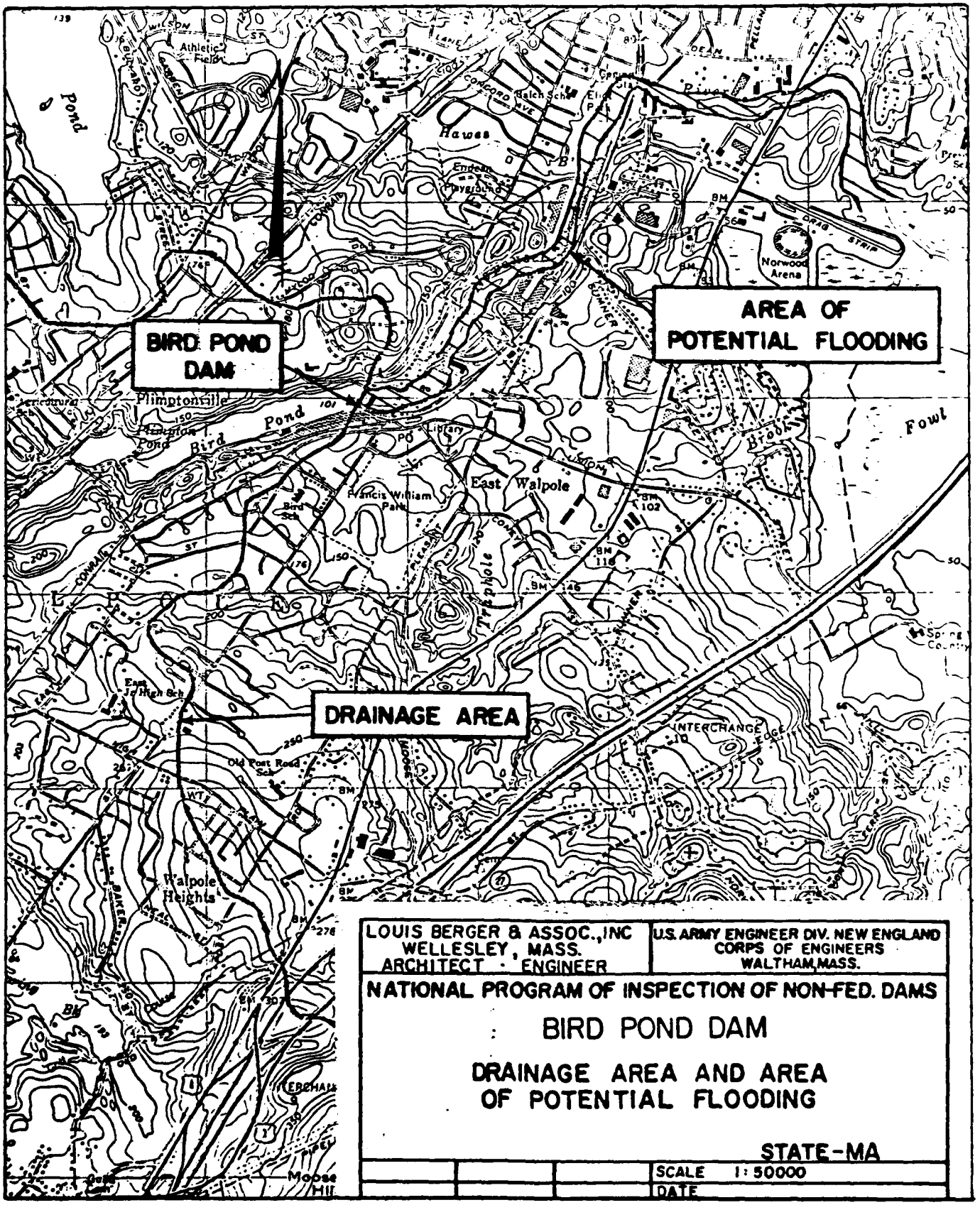
$$V_{AVE} = \frac{43 + 33}{2} = 38$$

$$Q_{P2} = 4140\left(1 - \frac{38}{185}\right) = 3{,}290 \text{ CFS}$$

For $Q = 3290$, $H = 6.4$ $\Delta H = 3.8$ FT
For $Q = 500$, $H = 2.6$


DRAINAGE AREA
BIRD POND DAM


DRAINAGE AREA
POND
M
AREA OF POTENTIAL FLOODING
DOVER
DOVER
LOUIS BERGER & ASSOC. INC
WELLESLEY, MASS
ARCHITECT ENGINEER
U.S. ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM MASS
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS
BIRD POND DAM
DRAINAGE AREA AND AREA OF POTENTIAL FLOODING
STATE - MA
SCALE
DATE



LOUIS BERGER & ASSOC., INC WELLESLEY, MASS. ARCHITECT · ENGINEER	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

BIRD POND DAM

DRAINAGE AREA AND AREA OF POTENTIAL FLOODING

STATE-MA

			SCALE 1:50000
			DATE

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

STATE	IDENTITY NUMBER	DIVISION	STATE	COUNTY	CONGR DIST.	STATE	COUNTY	CONGR DIST.	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY	MO	YR
MA	80[illegible]	NED	MA	021	09				BIRD POND DAM	4209.8	7113.1			

POPULAR NAME	NAME OF IMPOUNDMENT
	BIRD POND

REGION	BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	DIST FROM DAM (MI.)	POPULATION
01	09	NEPONSIT RIVER	WALPOLE	0	15500

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUCTURAL HEIGHT (FT.)	HYDRAULIC HEIGHT (FT.)	IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	IMPOUNDING CAPACITIES NORMAL (ACRE-FT.)
EARTH	1900	C	24	19	156	113

DIST OWN FED R REV/FED SCS A VER/DAT
NED N

REMARKS
3=PROCESS WATER

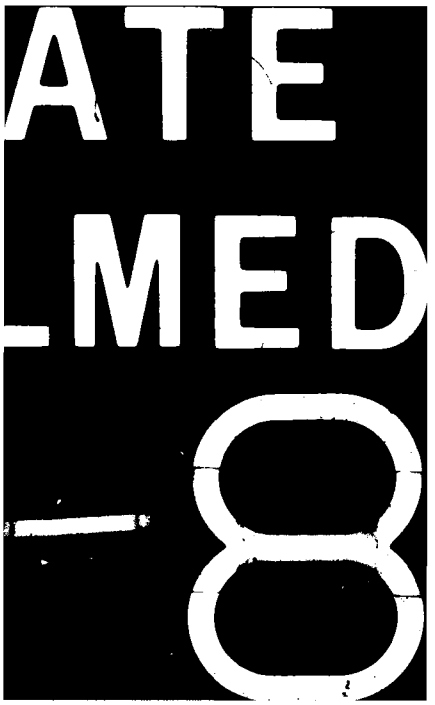
DIS. HAS	SPILLWAY LENGTH	SPILLWAY TYPE	SPILLWAY WIDTH (FT.)	MAXIMUM DISCHARGE (CFS)	VOLUME OF DAM (CY)	POWER CAPACITY INSTALLED (MW)	POWER CAPACITY PROPOSED (MW)	NAVIGATION LOCKS NO.	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)
1	291	C	31	505	3300											

OWNER	ENGINEERING BY	CONSTRUCTION BY
BIRD & SON, INC.		

REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	NONE

INSPECTION BY	INSPECTION DATE DAY	MO	YR	AUTHORITY FOR INSPECTION
LOUIS BERGER & ASSOC INC	14	APR	80	PL92-367

REMARKS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